UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

ENVIRONMENTAL ASSESSMENT

for the

Statewide
Wildlife Damage Management at Airports in Massachusetts
Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 Introduction

The United States Department of Agriculture (USDA) is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services (WS) program is the Act of March 2, 1931, as amended (7 U.S. C. 426-426c; 46 Stat. 1468), the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (P.L. 100-202), and the Fiscal Year 2001 Agriculture Appropriations Bill. WS activities are conducted in cooperation with other federal, state and local agencies; and private organizations and individuals. Federal agencies, including the United States Department of Interior, Fish and Wildlife Service, recognize the expertise of WS to address wildlife damage issues related to migratory birds.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (Leopold 1933, the Wildlife Society 1990, Berryman 1991). The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of The Animal Damage Control Program Final Environmental Impact Statement (USDA 1997). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that populations of the offending species are reduced through lethal methods.

WS's mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

A) Training of wildlife damage management professionals;
B) Development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
C) Collection, evaluation, and dissemination of management information;
D) Cooperative wildlife damage management programs;
E) Informing and educating the public on how to reduce wildlife damage and;
F) Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts associated with wildlife at airports in the State of Massachusetts. This analysis covers WS's plans for current and future WDM actions wherever they might be requested on civil and military airports within the State. This analysis relies mainly on existing data contained in published documents, primarily the Animal Damage Control Final Environmental Impact Statement (USDA 1997) to which this EA is tiered.

WS is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, WS and the land owner/administrator must complete Agreements for Control or WS Work Plans. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000- 6,003, (1995)). WS has decided in this case to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the

analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. All wildlife damage management that would take place in Massachusetts would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be made available consistent with the agency's NEPA procedures.

1.2 Purpose

The purpose of this EA is to analyze the potential environmental effects of a proposed WS program to reduce and manage property damage and human health and safety concerns caused by the mammal and avian species on airport environments within the State of Massachusetts. The following lists comprise the majority of species which may be affected by WS recommendations or activities on airports in Massachusetts. The lists are intentionally extensive to allow WS to quickly and efficiently recommend or implement management options in the wide variety of circumstances that can occur on airports across the Commonwealth of Massachusetts. These effects may be non-lethal, such as exclusion of bats from hangers or management of grass height to keep upland birds from nesting along runways or lethal such as removal of geese on runways or trapping of beaver flooding taxiways. Inclusion on the lists does not infer lethal control.

Mammal species may include, but are not necessarily limited to the following: white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), Virginia opossum (*Didelphis virginianus*), black bear (*Ursus americanus*),coyote (*Canis latrans*), red fox (*Vulpes fulva*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), feral cat (*Felix sp*.), striped skunk (*Mephitis mephitis*), fisher (*Martes pennanti*), short-tailed weasel (*Mustela erminea*), long-tailed weasel (*Mustela frenata*), mink (*Mustela vison*), river otter (*Lutra canadensis*), beaver (*Castor* canadensis), muskrat (*Ondatra zibethica*), woodchuck (*Marmota monax*), Eastern chipmunk (*Tamias striatus*), Eastern gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), Southern flying squirrel (*Glaucomys volans*), Northern flying squirrel (*Glaucomys sabrinus*), deer mouse (*Peromyscus maniculatus*) white-footed mouse (*Peromyscus leucopus*) boreal red-backed vole (*Clethrionomys gapperi*), meadow vole (*Microtus pennsylvanicus*), pine vole (*Pitymys pinetorum*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), house mouse (*Mus musculus*), meadow jumping mouse (*Zapus hudsonius*), woodland jumping mouse (*Napaeozapus insignis*), porcupine (*Erethizon dorsatum*), European hare (*Lepus europaeus*), snowshoe hare (*Lepus americanus*), blacktail jackrabbit (*Lepus californicus*), Eastern cottontail (*Sylvilagus floridanus*), New England cottontail (*Sylvilagus transitionalis*), shrews (*Sorex sp*.), short-tailed shrew (*Blarina brevicauda*), starnose mole (*Condylura cristata*), Eastern mole (*Scalopus aquaticus*), myotis bats (*Myotis sp.*), silver-haired bat (*Lasionycteris noctivagans*), Eastern pipistrel (*Pipistrellus subflavus*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*).

Avian species may include, but are not necessarily limited to the following: red winged black bird (*Agelaius phoeniceus)*, European starling *(Sturnus vugaris*), brown headed cowbird (*Molothrus ater*), eastern meadow lark (*Sturnella magna)*, horned lark (*Eremophila alpestris)*, killdeer (*Charadrius vociferus)*, Canada geese (*Branta canadensis), snow geese (*Chen caerulescens*), mute swan (*Cygnus olor*), mallard (*Anas platyrhynchos*), other ducks* (*Anatinae*), terns (*Sterninae*), gulls (*Larinae*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), cattle egret (*Bubulcus ibis*), green heron (*Butorides virescens*), black-crowned night-heron (Nycticorax nycticorax), yellow-crowned night-heron (*Nyctanassa violacea*), semipalmated sandpipers (*Calidris pusilla*), short-eared owl (*Asio flammueus*), great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), snowy owl (*Nyctea scandiaca*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Bueto lagopus*), American kestrel (*Falco sparverius*) , *Swansion's hawk (*Buteo swainsoni) , northern harrier (*Circus cyaneus*), Osprey (*Pandion haliaetus*), eastern wild* turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), rock dove (*Columba livia*), purple finch (*Carpodacus purpureus*), house finch (*Carpodacus mexicanus*), snow bunting (*Plectrophenax nivalis*), house sparrow (*Passer domesticus*), barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), tree swallow (*Iridoprocne bicolor*), chimney swift (*Chaetura pelagica*), American crow (*Corvus brachyrhnchos*), turkey vulture (*Cathartes aura*), common grackles (*Quiscalus*

quiscula), blue jay (*Cyabicutta crustata*), eastern bluebird (*Sialia sialis*), northern cardinal (*Cardinalis cardinalis*), upland sandpiper (*Bartramia longicaude*), monk parakeet (*Myiopsitta monachus*), belted kingfisher (*Ceryle alcyon*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), Northern flicker (*Colaptes auratus*), ring-necked pheasant (*Phasianus colchicus*), Northern bobwhite (*Colinus virginianus*), American woodcock (*Philohela minor*), ruffed grouse (*Bonasa umbellus*), and common snipe (*Capella gallinago*).

1.2.1 Summary of Proposed Action

The proposed action is to continue the current portion of the Massachusetts WS program that responds to requests for WDM assistance to protect property, and human health and safety at civil and military airports in the Commonwealth of Massachusetts. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to allow the use of any legal lethal or nonlethal technique or method, used singly or in combination, to meet the request or needs for resolving wildlife conflicts (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS may include shooting, trapping, DRC-1339 (Starlicide, Avitrol), registered toxicants, or euthanasia following live capture by trapping. Non-lethal methods used or recommended by WS may include habitat alteration, chemical repellents (e.g., methyl anthranilate), wire barriers and deterrents, netting, and harassment and scaring devices. The implementation of non-lethal methods such as habitat alteration and exclusion-type barriers would be the responsibility of the requesting airport or land manger to implement. Wildlife damage management activities would be conducted in the State, when requested and funded, on private or public property, including airport facilities and adjacent or nearby properties, after an *Agreement for Control* or other comparable document has been completed. All management actions would be consistent with other uses of the area and would comply with appropriate federal, state, and local laws.

1.3 Need For Action

1.3.1 Need for Wildlife Damage Management to Protect Property

Since 1990, one civilian airport in Massachusetts has recorded more that 350 wildlife strikes, of these 158 had identifiable remains. This Massachusetts airport experienced strikes from gulls (25%), waterfowl (5%), snow buntings (3%), raptors (2%) and other birds (65%) which includes pigeons, killdeer, European starlings, shorebirds and unknowns. This number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Cleary, et al. 2000). The USAF reports more than 192 wildlife strikes reported with military aircraft in Massachusetts from 1985 until present resulting hundreds of thousands dollars worth of damage to aircraft.

1.3.1.1 Need for Bird Damage Management to Protect Property

Birds are a continuous threat to aircraft for the simple fact that they are highly mobile and often prefer the habitat created by an airfield. With this in mind and following the basic laws of physics that no two items can occupy the same space at the same time, a pro-active management should be taken in order to reduce these threats. The risk that wildlife pose to aircraft is well documented with 27,433 civil aircraft collisions with birds reported in the U.S. from 1990 to 1999 (Cleary et al. 2000). A prime example where pro-active management would have saved lives was in September 1995, an USAF AWAC aircraft crashed immediately after take-off at Elmendorf Air Force Base, Alaska, killing all 24 personnel on board. The plane struck a flock of Canada geese that had been seen on a field adjacent to the airfield by a controller, unfortunately the E-3 crew or the Airfield management was not notified.

Birds occasionally damage structures on private property or public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on aircraft and automobiles parked at terminals, can occur because of uric acid from bird droppings. Pigeons, starlings and house sparrows sometimes cause structural damage to the inside of hangers and buildings. These birds often roost or nest in the rafters of the buildings where they damage the insulation, and wiring. Also, birds build their nest in engines and other compartments of parked aircraft.

1.3.1.2 Need for Mammal Damage Management to Protect Property

Mammals also pose a serious threat to aircraft. Animals such as deer, coyotes, skunks and raccoons often venture onto airfields and become a direct threat to planes both landing and taking off. The risk that wildlife pose to aircraft is well documented with 420 civil aircraft collisions with deer reported in the U.S. from 1990 to 1999 (Cleary et al. 2000). In the same time period, one Massachusetts airfield reported 13 deer/civil aircraft incursions, as well as coyotes, fox and one unidentified mammal. The unidentified mammal was responsible for causing an aircraft to over apply its breaks, resulting in the aircraft being forced off the runway when all its tires were blown out. The plane emergency exits were jammed due to the accident and 53 passengers had to be evacuated from the plane with the majority of them being treated for minor injuries. Mammal strikes result in aircraft damage and countless hours of aircraft down time and in some cases, as mentioned, injuries to passengers and crew (FAA, Wright 2000). Since 1985 the USAF has record more that 190 strikes that involved aircraft and mammals. These strikes resulted in more than $496,000 in damage. Of these strikes, deer are the most costly to aircraft. The most recent occurred at Laughlin AFB in March of 2000. A T-38 Talon hit a deer on landing and caused damage to the left main landing gear. Also at Little Rock AFB, between 1993 and 1998, three deer strikes were recorded, two of these in 1998. These strikes averaged over $4600 per strike. MA airports have also had their share of mammal strikes with the most costly strike involving two Coast Guard Falcon Jets colliding with deer during the months of May and June resulting in $135,786 in airplane repairs. Another airport in Massachusetts reported 51 runway/taxiway incursions by both deer and coyotes in a one year period. While at MA airports WS has been working to reduce threats though technical assistance and direct control. Such activities include the recommendation to modify habitat, to construct wildlife fencing and to use harassment techniques.

1.3.2 Need for Wildlife Damage Management to Protect Human Health and Safety

Wildlife often pose risks to human health and safety when their populations reach relatively high numbers or when they concentrate in a localized area. These risks include but are not limited to items such as transmission of diseases, injury or death to persons involved in wildlife/aircraft strikes and injury from aggressive behavior of wildlife.

Unfortunately, Massachusetts has records of one of the worst bird strike accidents in history. The accident occurred in 1960 at Logan International Airport on take-off when an Eastern airlines Turbo Prop Jet Lockheed (L 188) Electra collided with a flock of European starlings causing the number 1 engine to quit and the plane to crash in the harbor adjacent to the airport. Sixty-two of the 73 passengers were killed and ten were injured. The accident was presumably caused by a large flock of starlings that was roosting in a stand of phragmites and crossed the runway en route to their feeding area at a nearby landfill. Further investigation revealed fifty to one hundred dead starlings and five to ten dead gulls on the runway. It was also confirmed that bird material in the number one engine air inlet caused the auto-feathering device to shut off the power plant.

1.3.2.1 Mammal Damage Management to Protect Human Health and Safety

WS is often contacted and asked to solve problems involving mammals damage issues in relation to human safety. At Massachusetts Airports there is a continuing risk of a mammal/aircraft strikes which could result in the injury or death of the aircrew, passengers or personnel on the ground. WS has also been asked to resolve such problems as the removal of mammals from buildings and other areas where human activity his normal. Examples include the removal of skunks from hangers and around buildings. Deer that have wandered into areas such are terminals and fenced areas the airfield. Deer/car collisions have occurred on airport properties causing damage to personal property as well as injuries. Coyotes threatening security K-9 patrol teams and others. Another issue of concern that WS has been addressed with is wild mammal's carrying or transmitting rabies.

1.3.2.2 Bird Damage Management to Protect Human Health and Safety

Bird/aircraft strikes are a common hazard when birds occupy the same space as aircraft. The risk of injury is great in these incidents and the loss of life has happened many times. At MA airports, these threats come in many shapes and sizes. Resident Canada geese often use airfields for loafing, feeding and nesting areas.

In addition to the threats to aircrews, MA airports have requested assistance with feral domestic pigeon or nuisance blackbird or starling roost problems in relation to potential disease risks and the mess associated with droppings left by concentrations of birds. This problem is aesthetically displeasing and results in continual clean-up costs.

Feral domestic pigeons and starlings have been suspected in the transmission of 29 different diseases to humans, (Rid-A-Bird 1978, Weber 1979, and Davis et.al. 1971). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, paratyphoid, Pasteurellosis, and Listeriosis; mycotic (fungal) diseases such as aspergillosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozoal diseases such as American trypansomiasis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, starlings, and English sparrows (Weber 1979). Table 1-1 shows the more typical diseases affecting humans that can be transmitted by pigeons, sparrows and starlings.

Table 1-1. Information on some diseases transmittable to humans and livestock that are associated with feral domestic pigeons, starlings, and English sparrows. Information taken from Weber (1979).

Disease	Human Symptoms	Potential for Human Fatality
Bacterial:		
erysipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly to young children, old or infirm people
salmonellosis	gastroenteritis, septicaemia, persistent infection	possible, especially in individuals weakened by other disease or old age
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	rarely
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature	sometimes - particularly with newborns

	delivery, stillbirth	
Viral:		
meningitis	**inflammation of membranes covering the brain , dizziness, and nervous movements**	**possible — can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis**
encephalitis (7 forms)	**headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation**	**mortality rate for eastern equine encephalomyelitis may be around 60%**
Mycotic (fungal):		
aspergillosis	**affects lungs and broken skin, toxins poison blood, nerves, and body cells**	**not usually**
blastomycosis	**weight loss, fever, cough, bloody sputum and chest pains.**	**rarely**
candidiasis	**infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract**	**rarely**
cryptococcosis	**lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis**	**possible especially with meningitis**
histoplasmosis	**pulmonary or respiratory disease. May affect vision**	**possible, especially in infants and young children or if disease disseminates to the blood and bone marrow**
Protozoal:		
American trypanosomiasis	**infection of mucous membranes of eyes or nose, swelling**	**possible death in 2-4 weeks**
toxoplasmosis	**inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness**	**possible**
Rickettsial/Chlamydial:		
chlamydiosis	**pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate**	**occasionally, restricted to old, weak or those with concurrent diseases**
Q fever	**sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes**	**possible**

1.4 Current and Projected Work

WS is currently working at several airports within the state of Massachusetts. At these airports WS has implemented different methods to reduce wildlife hazards. Currently a full time WS Biologist provides technical assistance and direct control to several airports in the state. Other airports have contracted with WS to provide direct control and technical assistance on a part time basis, while others receive direct control only. Projected work at Massachusetts airports include conducting Wildlife Hazard Assessments, developing Wildlife Hazard Management Plans, and providing technical assistance as well as direct control. Examples of different work that has been done are: recommendations to modify habitat through grassland height management, converting airfields to a monoculture of fescue, constructing wildlife fences, as well as conducting direct control. Direct control at these airports include but are not limited to harassment, capture and relocation programs, and lethal removal.

1.5 Relationship of This Environmental Assessment to Other Environmental Documents

WS has issued a Final Environmental Impact Statement on the national APHIS/WS program (USDA 1997). This EA is tiered to the Final EIS. Pertinent information available in the FEIS has been incorporated by reference into this EA.

1.6 Objectives for the Wildlife Services WDM Program at Massachusetts Airports

- To reduce damaging wildlife strikes to less than 5 strikes per year per airport
- Reduce and maintain wildlife use in hangers to less than $1000 dollars in damage per year per airport.
- To maintain the runways and airfields to no down time caused by wildlife

1.7 Decision to be Made

Based on the scope of this EA, the decisions to be made are:

- Should WDM as currently implemented by the WS program be continued at airports in Massachusetts?
- If not, should WS attempt to implement one of the alternatives to an IWDM strategy as described in the EA?
- Might the continuing of WS's current program of WDM have significant impacts requiring preparation of an EIS?

1.8 Scope Of This Environmental Assessment Analysis

1.8.1 Actions Analyzed. This EA evaluates wildlife damage management by WS to protect property, and human health and safety at Massachusetts airports wherever such management is requested from the WS program.

1.8.2 American Indian Lands and Tribes. Currently WS does not have any MOUs or signed agreements with any American Indian tribe in Massachusetts. If WS enters into an agreement with a tribe, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.8.3 Period for Which this EA is Valid. This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS activities.

1.8.4 Site Specificity. This EA analyzes potential impacts of WS's WDM activities that could occur at civil and military airports, and adjacent or nearby properties in Massachusetts. This EA analyzes the potential impacts of such efforts wherever and whenever they might occur as part of the current program. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of wildlife damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS at Massachusetts airports (See USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.8.5 Public Involvement/Notification. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of

Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.9 AUTHORITY AND COMPLIANCE

1.9.1 Authority of Federal and State Agencies in Wildlife Damage Management at Massachusetts Airports

1.9.1.1 WS Legislative Authority

The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, which provides that:

"The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "bringing (damage) under control," rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

1.9.1.2 U.S. Fish and Wildlife Service (USFWS)

The USFWS authority for action is based on the Migratory Bird Treaty Act of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment,

transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President".

The authority of the Secretary of Agriculture with respect to the Migratory Bird Treaty was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 Fed. Reg. 2731, 53 Stat. 1433.

1.9.1.3 Federal Aviation Administration (FAA) - Regulations concerning Bird Aircraft Strike Hazards (BASH)

The FAA is empowered to issue airport operation certificates to airports serving air carriers, and to establish minimum safety standards for the operation of airports. Some of these regulations and polices directly involved the management of wildlife and wildlife hazards on and/or near airports. Under the Federal Aviation Regulations (FAR) 139.337 Wildlife Hazard Management, an airport is required to conduct a Wildlife Hazards Assessment and a Wildlife Management Plan when specific wildlife event(s) occur. Under the FAA/ADC Memorandum of Understanding (MOU), the WS programs supports all of the requirements contained in FAR 139.337. FAA Certalert No. 97-02 further clarifies the roles of, and relationships between, the FAA and WS with regards to wildlife hazards on or near airports. (USDA Managing Wildlife Hazards at Airports July 1998)

1.9.1.4 Massachusetts Department of Environmental Protection Legislative Authority

The Massachusetts Department of Environmental Protection is specifically charged by the General Assembly with the management of the state's wildlife resources. This is conducted through the Division of Fish and Wildlife. Statutory authorities also include public education, law enforcement and regulatory powers. Also, MA DEP has the statutory authority to manage damage to agriculture and property, and to protect human health and safety from damage involving mammals. WS needs permits from MA DEP in order to take any species protected by state statute or regulation. This includes game and fur animals, non-game animals, state threatened and endangered species and co-signature with the USFWS for migratory birds

1.9.2 Compliance with other Federal laws

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.9.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action at Massachusetts airports. When WS operational assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency. However, WS may agree to complete NEPA documentation at the request of the other federal agency.

1.9.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to use the expertise of the USFWS to ensure that "any action authorized, funded or

carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available" (Sec.7(a)(2)). WS obtained a Biological Opinion (B.O.) from USFWS in 1992 describing potential effects on T & E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F).

1.9.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended.

The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "take" of these species, except as permitted by the USFWS; therefore the USFWS issues permits for reducing bird damage. WS will obtain MBTA permits covering WDM activities that involve the taking of species for which such permits are required in accordance with the MBTA and USFWS regulations, or will operate as a named agent on MBTA permits obtained by cooperators. WS is also authorized by the MA DEP covering the intentional take migratory birds for damage management purposes from the MA DEP Wildlife Code which regulates take of migratory birds protected by state law.

1.9.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used or recommended by the WS program at Massachusetts airports are registered with and regulated by the EPA and MA and are used by WS in compliance with labeling procedures and requirements.

1.9.2.5 National Historic Preservation Act (NHPA) of 1966 as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. WS activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. WS has determined WDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties.

1.9.2.6 Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental justice is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make

environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

1.9.2.7 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).

Children may suffer disproportionately from environmental health and safety risks for many reasons. Wildlife damage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

1.9.2.8 Executive Order 13112 - Invasive Species

Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

1.9.2.9 Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its supplementing regulations (29CFR1910) on sanitation standards states that "Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected." This standard includes birds that may cause safety and health concerns at workplaces.

1.9.3 Compliance with other State laws

1.9.3.1 Massachusetts Environmental Law Chapter 131 Section 37

This regulation authorizes an owner of property, tenants of land, or if authorized, immediate family members or employees of the owner to protect property, subject to federal regulations for migratory birds and endangered species, any wild bird or mammal which is damaging property. The complete section follows.

§37. Hunting or killing of game by owners or tenant of property.

An owner or tenant of land or, if authorized by such owner or tenant, any member of his immediate family or his employee, as defined pursuant to section one of chapter sixty-two B, may, upon such land:-

(1) kill or attempt to kill, by means other than poisoning or trapping, any wild bird damaging his property, including domesticated animals, poultry and game on game-rearing farms or preserves, provided that such killing is not contrary to any federal law, rule or regulation.

(2) hunt or take by other means, except poison or snare, any mammal which he finds damaging his property except grass growing on uncultivated land. No such owner or tenant shall authorize any person other than a member of his immediate family or a person permanently employed by him, to place traps for the protection of said property other than during the open season, unless such owner or tenant has first obtained from the director a permit authorizing him so to do, which permit the director is hereby authorized to issue in his discretion, unless such authorized person holds a trapping license. All deer so killed shall be turned over to any environmental police officer and shall be disposed of by the director of law enforcement.

The following written reports shall be sent to the director by such owner or tenant acting under authority of this section:-(a) upon the taking of pheasant, ruffed grouse, hares or rabbits, or wounding or killing of a deer, a report stating the time and place, kind and number of birds or mammals so taken, wounded or killed, within twenty-four hours of such taking, wounding or killing; (b) upon the taking of any other birds or mammals, a report on or before January thirty-first of each year, stating the number and kinds of birds or mammals taken under authority of this section during the previous year. This section shall not be construed to limit any other provisions of this chapter. (*Chgd. by L. 1985, chap. 231(43); L.1996, chap. 15(26), eff. 2/12/96.)* (MA Env. Law Handbook).

2.0 CHAPTER 2 - ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional description of affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

2.1 Affected Environment

The Commonwealth of Massachusetts is located in southern New England. To the north Massachusetts is bordered by New Hampshire and Vermont while Connecticut and Rhode Island are to the south. New York is to the west and the Atlantic Ocean lies to the east. The Atlantic coast of Massachusetts is dominated by Cape Cod, a large peninsula that reaches into the ocean forming Buzzards Bay to the south and Cape Cod Bay to the north. There are also two large islands Nantucket and Martha's Vineyard, along with dozens of smaller islands. Massachusetts is the home of Boston, the largest city in New England which lies along the east coast. There are also metropolitan areas in central and western Massachusetts, Worcester, Springfield and Pittsfield and in the southeast, Fall River and New Bedford. There are two major river systems in the Commonwealth. The Merrimack in the northeast runs south out of New Hampshire then turns to the northeast until it enters the Atlantic and the Connecticut enters at the Vermont-New Hampshire border and proceeds south into Connecticut. The Wachusett and Quabbin Reservoirs are large man made impoundments in central Massachusetts that supply drinking water to the east.

The state is made up of several ecological regions that include but are not limited to the Connecticut River Valley, the Taconic and Berkshire Mountains, the Cape Cod glacial outwash plains, the Atlantic coastline and the Worcester Plateau. These ecosystems are home to a wide variety of habitat and wildlife. The state is also home to many airports and air bases; which includes Logan International Airport, numerous smaller civilian airports and several Air Force Reserve and National Guard units, including an Air Force logistics base and fighter wing. These airports and air bases occupy thousands of acres, which include grasslands, timber, runways, taxiways, recreational areas, office buildings and water impoundment's.

2.2 Issues Analyzed in Detail in Chapter 4

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on Target Wildlife Species Populations
- Effects on Non-target Species Populations, including T&E Species
- Economic Losses to Property
- Effects on Human Health and Safety
- Effects on Aesthetics
- Humanness and Animal Welfare Concerns of Lethal Methods Used by WS

2.2.1 Effects on Target Wildlife Species Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA are the mammal and bird species listed in section 1.2. A minimal number of individuals are likely be

killed by WS's use of lethal control methods under the proposed action in any one year. Individual numbers of bird and mammal species take by WS in CY 97-00 are list in tables 4-1 and 4-2, respectively.

2.2.2 Effects on Non-target Species Populations, including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage control methods and activities on non-target species, particularly Threatened and Endangered (T&E) species. WS's standard operating procedures include measures intended to mitigate or reduce the effects on non-target species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed.

2.2.3 Economic Losses to Property

A major concern by the aviation industry is the economic impact of wildlife damage to aircraft and other airport property. These people are concerned as to whether the proposed action or any of the alternatives would reduce such damage to more acceptable levels.

2.2.4 Effects on Human Health and Safety A common concern among the public is whether the proposed action or any of the alternatives pose an increased threat to human health and safety. Specifically, there is concern that the lethal methods of wildlife removal (i.e., chemicals, traps, firearms) may be hazardous to people and that wildlife pose a threat to human and health and safety. A formal risk assessment of WS operational management methods found that risks to human safety were low (USDA 1997, Appendix P). WS SOP's include measures intended to mitigate or reduce the effects on human health and safety and are presented in Chapter 3.

2.2.4.1 Safety and efficacy of chemical control methods

Some individuals may have concerns that chemical used for wildlife control should not be used because of potential adverse effects on people from being exposed to the chemicals directly or to animals that have died as a result of the chemical use.

Under the alternatives proposed in this EA, the primary toxicant proposed for use by WS is DRC-1339 (Starlicide), which would be primarily used to remove feral domestic pigeons and starlings or blackbirds in damage situations. The EPA through FIFRA regulates DRC-1339 and pesticide use. In addition, Massachusetts Pesticide Control Laws and WS Directives also regulate pesticide use. The chemical bird repellent Flight control could be used to reduce feeding activity on the airfield. Flight Control is a Bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area. Another chemical method that could be used is Avitrol, which is classified as an avian distressing agent and is normally used to avert certain bird species from using certain problem areas. Other chemicals available for use include the tranquilizer Alpha-Chloralose (for live-capturing nuisance waterfowl and pigeons) and methyl anthranilate (artificial grape flavoring, which also has bird repellent capabilities).

In some situations, a chemical control alternative may be considered for managing nuisance mammals. Under the alternatives proposed in this EA, registered rodenticides could be used to manage damaging populations of rodents in both field and structural environments. These

rodenticides fall into two basic categories: 1) anticoagulants; 2) non-anticoagulants (such as Bromethalin, Cholecalciferol, and zinc phosphide).

2.2.4.2 Impacts on human safety of non-chemical WDM methods

Some people may be concerned that WS's use of firearms, conibear traps and pyrotechnic scaring devices could cause injuries to people. WS personnel occasionally use traps, rifles and shotguns to remove wildlife that are causing damage. There is some potential fire hazard to airport property from pyrotechnic use.

Firearm use in wildlife damage management can be a publicly sensitive issue. Safety issues related to the misuse of firearms and the potential human hazards associated with firearms use are concerns both to the public and WS. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Additionally, WS runs thorough background checks on all new employees entering the agency and the Massachusetts WS program conducts annual firearms training for all personnel. Also, the state of Massachusetts has strict laws requiring State conducted background checks before issuing Firearms Identification Cards that allow WS employees to carry and use firearms.

2.2.4.3 Wildlife impacts on human health and safety

The concern stated here is that the absence of adequate WDM would result in adverse effects on human health and safety, because bird and mammal strikes on aircraft would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries or loss of human lives from wildlife strikes to aircraft. There is also the concern of that wildlife frequenting buildings and hangers may have the potential to increase the probability that wildlife disease could be transmitted to people working or visiting such areas.

2.2.5 Effects on Aesthetics

2.2.5.1 Effects on Human Affectionate-Bonds with Individual animals and on Aesthetic Values of Wildlife Species

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general, and today a large percentage of American households have pets. Some individual members or groups of wildlife species habituate and learn to live in close proximity to humans. Some people in these situations feed such birds/mammals and/or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. However, some people may consider individual wild animals and birds as “pets” or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or birdhouses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

Public reaction to damage management actions is variable because individual members of the public can have widely different attitudes toward wildlife. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful. Some individuals that are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale, etc.), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing, etc.), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using parts of, or the entire animal) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefitting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. The public's ability to view wildlife in a particular area would be more limited if the birds and mammals are removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a damage management action. In addition, the opportunity to view or feed other wildlife would be available if an individual makes the effort to visit local wildlife management areas and other sites with adequate habitat and local populations of the species of interest. If insufficient habitat is available off of airports, it is the responsibility of state and federal wildlife managers, as well as local and private organizations, to acquire, protect and manage such habitat. It should be remembered that airports are not designed or intended to be wildlife refuges, nor are they safe places for wildlife to live and raise their young.

Some people have an idealistic view of wildlife and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to predator damage management want WS to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment. Some people do not believe that individual animals or nuisance bird roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view birds and other wildlife species are lessened by WS non-lethal harassment efforts.

Massachusetts WS would only conduct wildlife damage management at the request of the affected property owner or resource manager. If WS received requests from an individual or official for wildlife damage management, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.2.5.2 Effects on Aesthetic Values of Property Damaged by Birds

Airport personnel have expressed concerns of bird roosting in trees and structures on airport property and are generally concerned about the negative aesthetic appearance of bird droppings. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns where birds are roosting, or visitors irritated by the odor of or of having to walk on fecal droppings.

2.2.6 Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS.

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if " . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."

Suffering is described as a " . . . highly unpleasant emotional response usually associated with pain and distress." However, suffering " . . . can occur without pain . . ." and " . . . pain can occur without suffering . . . " (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for " . . . little or no suffering where death comes immediately . . . " (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would " . . . probably be causes for pain in other animals . . . " (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since " . . . neither medical or veterinary curricula explicitly address suffering or its relief" (CDFG 1991).

Research suggests that with some methods, such as restraint in leg-hold traps, changes in the blood chemistry of trapped animals indicate "*stress*" (USDA 1997: 3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The AVMA states *"... euthanasia is the act of inducing humane death in an animal."* and *"... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness."* (Beaver et al. 2001).

Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The AVMA states that "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible* (Beaver et al. 2001).

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans if damage management methods were not used. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some WDM methods are used in situations where non-lethal damage management methods are not practical or effective. Massachusetts WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/Standard Operating Procedures (SOP) used to maximize humaneness are listed in Chapter 3.

2.3 Issues Used to Develop Mitigation

2.3.1 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Population"*

Environmental Justice (EJ) is a movement promoting the fair treatment of all races, income, and culture with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. EJ has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. (The EJ movement is also known as Environmental Equity - which is the equal treatment of all individuals, groups or communities regardless of race, ethnicity, or economic status, from environmental hazards).

EJ is a priority both within the USDA/APHIS and WS. Executive Order 12898 requires Federal agencies to make EJ part of their mission, and to identify and address disproportionately high adverse human health and environmental effects of Federal programs, policies, and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. WS developed a strategy that: 1) identifies major programs and areas of emphasis to meet the intent of the Executive Order, 2) minimize any adverse effects on the human health and environment of minorities and low-income persons or populations, and 3) carries out the APHIS mission. To that end, APHIS operates according to the following principles: 1) promote outreach and partnerships with all stakeholders, 2) identify the impacts of APHIS activities on minority and low-income populations, 3) streamline government, 4) improve the day-to-day operations, and 5) foster nondiscrimination in APHIS programs. In addition, APHIS plans to implement Executive Order 12898 through its compliance with the provisions of NEPA.

All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by WS are regulated by the EPA through FIFRA; by the FDA; the ODA, Division of Plant Industry, Pesticide Regulation; by MOU's with Federal land management agencies, and program directives. Based on a thorough risk assessment, APHIS concluded that when WS program chemicals are used following label directions, they are selective to target individuals or populations and such use has negligible impacts on the environment

(USDA 1997, Appendix P). The WS operational program, discussed in this document, properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority or low-income persons or populations.

2.3.2 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

WS prioritizes the identification and assessment of environmental health and safety risks that may disproportionately affect children. Children may suffer disproportionately from environmental health and safety risks for many reasons, including their physical and mental status. WS has concluded that the proposed management program would not create an environmental health or safety risks to children because the program would only make use of legally available and approved damage management methods applied where such methods are highly unlikely to adversely affect children.

2.4 Issues Considered But Not in Detail with Rationale

2.4.1 Appropriateness of Preparing an EA (Instead of an EIS) for Such a Large Area

Some individuals might question whether preparing an EA for an area as large as Massachusetts would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of Federal or other agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency cleanup organizations, insurance companies, etc. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a predation damage problem has become intolerable to the point that they request assistance from WS. Nor would WS be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and state agencies. Such broad scale population control would also be impractical, if not impossible, to achieve if a determination is made through this that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones.

2.4.2 Impacts of Harassment and Removal Methods on Migratory Bird Species

Some people are concerned with the impacts of WS's non-lethal and lethal control methods on migratory bird species. WS abides by laws and regulations of the MBTA regarding the removal and harassment of migratory birds (50 CFR 21). WS minimizes potential impacts to non-target and target migratory bird species with mitigation measures/SOP's listed in Chapter 3**.** Non-target migratory bird species usually are not affected by WS's control methods, except for the occasional scaring effect from the sound of gunshots or scaring devices. In these cases, migratory birds may temporarily leave the immediate vicinity of shooting/scaring, but would most likely return after conclusion of the action.

3.0 CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

Introduction

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992) as described in Chapter 2 (pages 20-35), Appendix J (Methods of Control), Appendix N (Examples of WS Decision Model), and Appendix P (Risk Assessment of Wildlife Damage Control Methods Used by USDA, Wildlife Services Program) of the ADC FEIS (USDA 1997).

Chapter 3 contains a discussion of the project alternatives, including those that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), alternatives considered but not analyzed in detail, with rationale, and mitigation measures and SOP's for wildlife damage management techniques. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Evaluation of the affected environments will be addressed in more detail in Chapter 4.

3.1 DESCRIPTION OF THE ALTERNATIVES

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with the Council on Environmental Quality's (CEQ's) definition (CEQ 1981).

Alternatives analyzed in detail are:

- **Alternative 1** - Continue the Current Federal WDM Program/Integrated Wildlife Damage Management. This is the **Proposed Action** and is the ***"No Action"*** alternative as defined by the Council on Environmental Quality for analysis of ongoing programs or activities.

- **Alternative 2** - Non-lethal WDM only by WS

- **Alternative 3** - Lethal WDM only by WS

- **Alternative 4** - No Federal WS WDM. This alternative consists of no federal WDM program by WS.

3.1.1 Alternative 1 - Continue the Current Federal WDM Program /Integrated Wildlife Damage Management (No Action/Proposed Action).

The proposed action is to continue the current portion of the Massachusetts WS program that responds to requests for WDM assistance to protect property, and human health and safety at civil and military airports in the State of Massachusetts. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to allow the use of any legal lethal or nonlethal technique or method, used singly or in combination, to meet the request or needs for resolving wildlife conflicts (Appendix B). Airport personnel requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Lethal methods used by WS may include shooting, trapping, DRC-1339 (Starlicide, Avitrol), registered toxicants, or euthanasia following live capture by trapping. Non-lethal methods used or recommended by WS may include habitat alteration, chemical repellents (e.g., methyl anthranilate), wire barriers and deterrents, netting, and harassment and scaring devices. The implementation of non-lethal methods such as habitat alteration and exclusion-type barriers would be the responsibility of the requesting airport or land manger to implement. Wildlife damage management activities would be conducted in the State, when requested and funded, on private or public property, including airport facilities and adjacent or nearby properties, after an *Agreement for Control* or other comparable document has been completed. All management actions

would be consistent with other uses of the area and would comply with appropriate federal, state, and local laws.

3.1.2 Alternative 2 - Non-lethal WDM Only By WS. This alternative would require WS to use and recommend non-lethal methods to resolve wildlife damage problems in all situations. Requests for information regarding lethal management approaches would be referred to MADFW, USFWS, local animal control agencies, or private businesses or organizations. Persons receiving technical assistance could still resort to lethal methods that were available to them. Individuals might choose to implement WS nonlethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary. Currently, DRC-1339 and Alpha-Chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals would be illegal. Under this alternative, Alpha-Chloralose would be used by WS personnel to capture and relocate wildlife. Avitrol could be used by State certified restricted-use pesticide applicators. Appendix B describes the non-lethal methods available for use and recommendation by WS under this alternative.

3.1.3 Alternative 3 - Lethal WDM Only By WS. This alternative would require WS to use and recommend lethal methods to resolve wildlife damage problems in all situations. Technical assistance would include making recommendations to the USFWS and MADFW regarding the issuance of permits to resource owners to allow them to take wildlife by lethal methods. Requests for information regarding non-lethal management approaches would be referred to MADFW, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary. Currently, DRC-1339 and Alpha-Chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals would be illegal. Avitrol could be used by State certified restricted-use pesticide applicators. Appendix B describes the lethal methods available for use and recommendation by WS under this alternative.

3.1.4 Alternative 4 - No Federal WS WDM. This alternative would eliminate Federal involvement in WDM at all airports in Massachusetts. WS would not provide direct operational services or technical assistance. All requests for information regarding the management of wildlife damage at airports would be referred to MADFW, USFWS, local animal control agencies, or private businesses or organizations. Individuals might choose to implement their own wildlife damage control program, use contractual services of private businesses, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary. DRC-1339 and Alpha-Chloralose are only available for use by WS employees and would not be available for use under this alternative. Therefore, use of these chemicals by private individuals would be illegal. Avitrol could be used by State certified restricted-use pesticide applicators.

3.2 WDM Strategies and Methodologies Available to WS at Massachusetts Airports

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2, and 3 described above. Alternative 4 would terminate both WS technical assistance and operational WDM by WS. **Appendix B** is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM).

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[1] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., restricting flying times), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem. WS considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requester, WS, or other agency personnel, as appropriate. Two strategies are available:

1. Preventive Damage Management is applying wildlife damage management strategies before damage occurs, based on historical problems and data. All non-lethal methodologies, whether applied by WS or resource owners, are employed to prevent damage from occurring and therefore fall under this heading. When requested, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. An example would be a airport facility installing and maintaining a perimeter fence around an airfield to minimize access of wildlife (i.e., white-tailed deer, coyote) or scaring birds away from active runways.

2. Corrective Damage Management Corrective damage management is applying wildlife damage management to stop or reduce current losses. As requested and appropriate, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. An example would be the removal of wildlife on or near an active runaway after a wildlife strike or a near miss has occurred. Often times this involves the lethal removal of individual animals.

3.2.2 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3.1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage

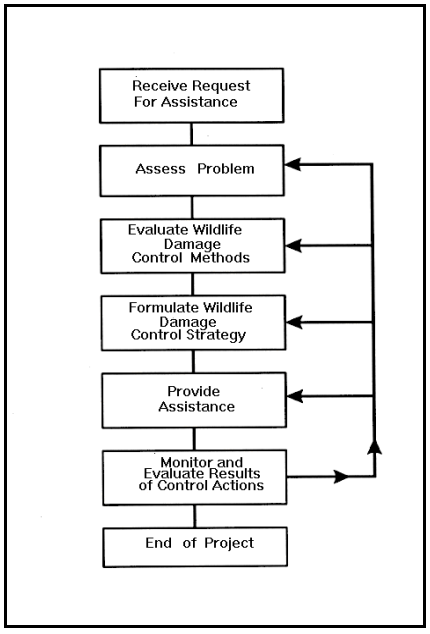

Figure 3.1 WS Decision Model

[1] The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns

management strategy. The Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.

3.2.3 The IWDM Strategies that WS Employs in Massachusetts

Technical Assistance Recommendations (implementation is the responsibility of the requestor)

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. Technical assistance may require substantial effort by WS personnel in the decision making process, but the implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems, these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS' NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

Direct Control Damage Management Assistance (assistance conducted or supervised by WS personnel)

Direct control damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when *Agreements for Control* or other comparable instruments provide for WS direct control damage management. The initial investigation defines the nature, history, extent of the problem, species or property directly and indirectly damaged, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex.

Educational Efforts

Education is an important element of WS program activities because wildlife damage management is about finding "balance" or coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to producers, homeowners, state and county agents, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are periodically updated on recent developments in damage management technology, laws and regulations, and agency policies.

3.2.4 Decision Making by Affected Individuals

The WS program in Massachusetts follows the "Co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of wildlife and effective, practical, and reasonable

methods available to the reduce wildlife damage/conflicts. This includes non-lethal and lethal methods. Some technical assistance on alleviating damage/conflicts caused by wildlife is available from state wildlife agencies, county extension agents, county soil and water conservation districts, county animal control, and private nuisance wildlife control agents. WS and other state and Federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available. Resource owners/managers directly affected by conflicting wildlife have direct input into the resolution of such problems, including the decision on which effective methods should be used to resolve the wildlife conflict. Resource owners/managers may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

3.2.5 Wildlife Damage Management methods available for use or recommendation by WS. (See **Appendix B** for detailed descriptions of WDM methodologies)

3.2.5.1 Non-chemical, Non-lethal methods

Property owner practices consist primarily of non-lethal preventive methods such as cultural methods[2] and habitat modification.

Animal behavior modification refers to tactics that alter the behavior of wildlife to reduce damages. Some but not all of these tactics include:

- Exclusions such as fencing
- Propane cannons (to scare birds and mammals)
- Pyrotechnics (to scare birds and mammals)
- Distress calls and sound producing devices (to scare wildlife)
- Visual repellents and scaring tactics

Relocation of damaging birds and mammals as directed by State wildlife agency to other areas.

Nest destruction of the target species before eggs or young is in the nest.

Egg addling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; or directly removing eggs from a nest and destroying them.

Habitat/environmental modification to attract or repel certain wildlife species.

Live traps are various types of traps designed to capture birds and mammals alive for relocation or euthanasia. Some examples are, snares, leg-hold traps, cage traps, clover traps, decoy traps, nest box traps, mist nets, etc.

3.2.5.2 Chemical, Non-lethal Methods

Avitrol is a chemical frightening agent registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. This chemical works by causing distress behavior in the birds that consume treated kernels from a mixture of treated and untreated bait, which generally frightens the other birds from the site. Generally birds that eat the treated bait will die (Johnson and Glahn 1994).

[2] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage

Alpha-chloralose is used as an immobilizing agent, which is a central nervous system depressant, and used to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well-contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds.

Methyl Anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl. It can be applied to turf or surface water or as a fog to repel birds from small areas.

Flight Control (anthraquinone) is a chemical bird repellent that could be used to reduce feeding activity on the airfield. Flight Control is a bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area (Avery et al. 1997).

Tactile repellents are used to deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that birds avoid. This method should be differentiated from glue traps where animals adhere to a sticky surface, allowing removal.

3.2.5.3 Mechanical, Lethal Methods

Shooting is the practice of selectively removing target species by shooting with an air rifle, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques.

Snap traps are more commonly know as mouse and rat traps. This type of trap remains legal in Massachusetts. These traps are commonly used to remove rodents and other small mammals such as weasels. A modified rat snap trap is often used to remove individual woodpeckers, starlings, and other cavity using birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area caused by the woodpecker. These traps pose no imminent danger to pets or the public.

Conibear (Body Gripping or Smooth Wire) Traps are the steel framed traps used to capture and quickly kill aquatic mammals. The traps are made of two steel square frames that are hinged on two sides and have one or two springs. When activated, the frames are quickly brought together causing death by cervical dislocation and/or suffocation by constriction in a very short period of time. In Massachusetts, conibear traps may only be used by special permit to take beaver or muskrats that are causing a threat to human health and safety or damage to property. Massachusetts WS only uses conibear traps size 330 for beaver and size 110 for muskrats. These are used exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface.

Cervical dislocation is sometimes used to euthanasia birds that are capture in live traps. AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and of small birds (Beaver et al. 2001).

Sport hunting is sometimes recommended when target species can be legally hunted.

3.2.5.4 Chemical, Lethal Methods

DRC-1339 is a slow acting avicide for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for feral domestic pigeon, starling, and blackbird damage management under the current program.

Carbon dioxide (CO2) gas is an American Veterinary Medical Association (AVMA) approved euthanasia method which is sometimes used to euthanize birds and mammals which are captured in live traps or by chemical immobilization and when relocation is not a feasible option (Beaver et al. 2001). Live animals are placed in a container or chamber into which CO2 gas is released. The animals quickly expire after inhaling the gas.

Zinc phosphide is a metallic toxicant most often used for rodent control, such as rats, mice, voles, and muskrats. It can be used to treat a variety of baits, depending on the species being controlled.

Warfin and Diphacinone are anticoagulant rodenticides used to control rodents around buildings and other structures.

3.3 Examples of WS Direct Operational and Technical Assistance in WDM at Massachusetts airports

While working at Massachusetts airports, WS has implemented and conducted many projects that provide both Direct Damage Management and Technical Assistance (TA). Such projects include but are not limited to the problems of white-tailed deer (Odocoileus virginianus) on the airfields and runways; pigeons roosting in hangars causing damage to aircraft and equipment due to droppings as well as posing a threat to aircraft; and raptors (birds of prey) using airfields.

For the white-tailed deer problem, WS provided technical assistance by making such suggestions as modifying the habitat and the construction a wildlife fencing around airfields. WS also monitors and tracks the population using spotlight counts. Direct control methods employed by WS include harassment using pyrotechnics and lethal removal by sharp shooting.

For the pigeon roosts, TA that WS provided included recommendations of exclusion and changing operating procedures, such as screening off construction gaps and keeping hangar doors closed when not in use. WS also provided direct control through shooting with air rifles.

For raptor problems, WS has provided TA by making suggestions of restricting flying when bird watch conditions change from low to moderate or severe; changes in habitat and harassment techniques. Direct control provided by WS includes harassment by pyrotechnics, shooting and capture and relocation programs.

3.4 Alternatives Considered But Not Analyzed in Detail With Rationale

3.4.1 Technical Assistance Only

This alternative would not allow WS operational WDM at Massachusetts airports. WS would only provide technical assistance and make recommendations when requested. This alternative has been determined ineffective based upon the unsuccessful attempts by airport personnel to conduct WDM prior to WS direct control involvement.

3.4.2 White-tailed deer population stabilization through birth control. Deer would be sterilized or contraceptives administered to limit the ability of deer to produce offspring. Contraceptive measures for deer can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation,

and immunocontraception (the use of contraceptive vaccines). These techniques would require that deer receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of this method would be subject to approval by Federal and State Agencies. This alternative was not considered in detail because: (1) it would take a number of years of implementation before the deer population would decline and therefore, damage would continue at the present unacceptable levels for a number of years; (2) surgical sterilization would have to be conducted by licensed veterinarians, would therefore be extremely expensive, (3) it is difficult, time-consuming, and expensive to effectively live trap, chemically capture, or remotely treat the number of deer necessary to effect an eventual decline in the population; (4) no chemical or biological agents for contracepting deer have been approved for use by State and Federal regulatory authorities.

3.4.3 Live-capture and relocation of white-tailed deer. Under this alternative WS would capture deer alive using cage-type live traps or capture drugs administered by dart gun and then relocate the captured deer to another area. Numerous studies have shown that live-capture and relocation of deer is relatively expensive, time-consuming, and inefficient (Ishmael and Rongstad 1984, O'Bryan and McCullough 1985, Diehl 1988, Jones and Witham 1990, Ishmael et al. 1995). Population reduction achieved through capture and relocation is labor intensive and would be costly ($273-$2,876/deer) (O'Bryan and McCullough 1985, Bryant and Ishmael 1991). Additionally, relocation frequently results in high mortality rates for relocated deer (Cromwell et. al. 1999, O'Bryan and McCullough 1985, Jones and Witham 1990, Ishmael et al. 1995). Deer frequently experience physiological trauma during capture and transportation and deer mortality after relocation has ranged from 25-89% (Jones and Witham 1990, Mayer et al. 1993). O'Bryan and McCullough (1985) found that only 15% of radio-collared black-tailed deer that were live-captured and relocated from Angel Island, California, survived for 1 year after relocation. Although relocated deer usually do not return to their location of capture, some do settle in familiar suburban habitats and create nuisance problems for those communities (Bryant and Ishmael 1991). High mortality rates of relocated deer, combined with the manner in which many of these animals die, make it difficult to justify relocation as a humane alternative to lethal removal methods (Bryant and Ishmael 1991). Chemical capture methods require specialized training and skill. A primary limitation of darting is the limited range at which deer can be effectively hit which is generally less than 40 yards. With modern scoped rifles, however, a skilled sharpshooter can hit the head or neck of a deer for a quick kill out to 200 yards and beyond. Thus, chemical capture is far less efficient, more labor intensive, and much more costly than removal with rifles. Additionally, the American Veterinary Medical Association, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists opposes relocation of mammals because of the risk of disease transmission (USDA 1997).

3.5 Mitigation and Standard Operating Procedures (SOP) for Wildlife Damage Management Techniques

3.5.1 Mitigation in Standard Operating Procedures (SOPs)

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Massachusetts uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997). Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS's Standard Operating Procedures include:

- The WS Decision Model thought process which is used to identify effective wildlife damage management strategies and their impacts.
- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid impacts to T&E species.

- EPA-approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse impacts to the environment when chemicals are used in accordance with label directions.
- All WS Specialists in the State who use restricted chemicals are certified restricted-use pesticide applicators by Massachusetts DEP and trained by program personnel or others who are experts in the safe and effective use of chemical WDM materials.
- The presence of non-target species is monitored before using DRC-1339 to control birds, to reduce the risk of significant mortality of non-target species populations.
- Research is being conducted to improve WDM methods and strategies so as to increase selectivity for target species, to develop effective nonlethal control methods, and to evaluate non-target hazards and environmental impacts.
- Preference is given to nonlethal methods, when practical and effective. If practical and effective nonlethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Some additional mitigating factors specific to the current program include:

- Management actions would be directed toward localized populations or groups of target species and/or individual offending members of those species. Generalized population suppression across the State, or even across major portions of the state, would not be conducted.
- WS uses WDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazard to the public is even further reduced.

3.5.2 Additional Mitigation Specific to the Issues

The following is a summary of additional mitigation measures that are specific to the issues listed in Chapter 2 of this document.

3.5.2.1 Effects on Target Species Populations

- WDM activities are directed to resolving wildlife damage problems by taking action against individual problem birds and mammals, or local populations or groups, not by attempting to eradicate populations in the entire area or region.
- WS take is monitored by comparing numbers of birds and mammals killed by species or species group (e.g., blackbirds) with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4).

3.5.2.2 Effects on Non-target Species Populations Including T&E Species

- WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding non-targets.

- Observations of birds are made to determine if non-target or T & E species would be at significant risk from WDM activities.
- WS has consulted with the USFWS regarding potential impacts of control methods on T&E species, and abides by reasonable and prudent alternatives (RPAs) and/or reasonable and prudent measures (RPMs) established as a result of that consultation. For the full context of the Biological Opinion see the ADC FEIS, Appendix F (USDA 1997). Further consultation on species not covered by or included in that formal consultation process has been initiated with the USFWS and WS will abide by any RPAs, RPMs, and terms and conditions that result from that process to avoid jeopardizing any listed species.
- WS uses chemical methods for WDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.
- WS would retrieve all dead birds to the extent possible, following treatment with Avitrol.
- Avitrol will not be used when bald eagles are present at a site, within ½ mile of nest sites or around shoreline areas where eagles loaf.
- Even though DRC-1339 offers no secondary poisoning risk to bald eagles, dead birds will be retrieved to the extent possible.

3.5.2.3 Effects on aesthetics

- Treated bait would be applied as discretely as possible.
- Dead birds would be picked up in early in the morning to lessen the likelihood of people seeing the dead birds.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the proposed action to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the proposed action or current program alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The background and baseline information presented in the analysis of the current program alternative thus also applies to the analysis of each of the other alternatives.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Impacts: Discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the ***National Historic Preservation Act:*** WS WDM actions are not undertakings that could adversely affect historic resources (See Section 1.7.2.5).

4.1 Environmental Consequences for Issues Analyzed in Detail

4.1.1 Effects on Target Species Wildlife Populations

Analysis of this issue is limited primarily to those species most often killed during WS WDM. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997). Magnitude is described in USDA (1997) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage.

4.1.1.1 Alternative 1. - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action as described in Chapter 1)

WS's activities in resolving wildlife damage have been more than 99% non-lethal. Table 4-1 shows the numbers of birds and mammals killed by species and methods as a result of WS WDM activities at MA airports from CY 97 through CY 01. Under this alternative the number of birds and mammals would likely remain the same or not change substantially. If the numbers do change, WS will address the issue in the annual monitoring reports.

Table 4-1. Wildlife Lethally Removed by WS for Wildlife Damage Management in FY 98, 99, 00 and 01 at MA Airports.

Species	Body Gripping/Snap Trap	Decoy/Other Trap	Cage Trap	Gas Cartridge	Shooting
Herring Gulls					1
Pigeons		106			282
Canada Geese					40
Eastern Wild Turkeys					33
European Starlings					45
Osprey					1
Striped Skunks					2
Gray Squirrels			5		
Muskrats	19				
Beavers	8				11
Coyotes					11
Meadow Voles	1		2		
Muskrat	1				
River Otter	1				
Raccoon	1				
White-tailed Deer					19
Woodchucks [1]			2	46	

[1]Estimated number of woodchucks taken based on one gas cartridge. Per den and maximum # of 8 per den.

Table 4-2 Wildlife Harassed and Lethally Removed by WS for Wildlife Damage Management in FY99-02 at MA Airports.

Species	Killed 99	Dispersed /Freed 99	Killed 00	Dispersed/ Freed 00	Killed 01	Dispersed/ Freed 01	Killed 02	Dispersed/ Freed 02
Herring Gulls	0	0	1	22	0	0	0	0
Pigeons	103	0	119	0	166	0	11	0
Canada Geese	12	110	24	223	4	43	0	0
Eastern Wild Turkey	9	51	11	48	13	51	0	0
European Starlings	10	0	10	0	25	125	0	0
Mixed * Blackbirds	0	0	0	0	0	0	0	0
Ospreys	0	0	0	0	1	0	0	0
Striped Skunks	2	0	0	0	0	0	0	0
Gray Squirrels	5	0	2	0	0	0	0	0
Muskrat	0	0	0	0	0	0	0	0
Beaver	3	0	3	0	13	0	2	0

Coyotes	2	0	8	0	1	0	0	0
Meadow Voles	0	0	0	0	3	0	0	0
Muskrat	0	0	0	0	1	0	0	0
River Otter	0	0	0	0	1	0	0	0
Raccoon	0	0	0	0	1	0	0	0
White-tailed Deer	2	0	9	0	8	1	0	0
Wood-chuck	13	0	3	0	32	0	0	0

* Mixed Blackbirds consists of Brown-headed Cowbirds, Red-winged Blackbirds, Common Grackles and American Crows

4.1.1.1.1 Starling and Blackbird Population Impacts

Colonization of North America by the European Starling began on March 6, 1890 when a Mr. Eugene Scheifflin, a member of the Acclimatization Society, released 80 starlings into New York's Central Park. The birds thrived and exploited their new habitat. By 1918, the advance line of migrant juveniles extended from Ohio to Alabama; by 1926 from Illinois to Texas; by 1941 from Idaho to New Mexico; and by 1946 to California and Canadian coasts (Miller 1975). In just 50 short years the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984).

Precise counts of blackbird and starling populations do not exist but one estimate placed the United States summer population of the blackbird group at over 1 billion (USDA 1997) and the winter population at 500 million (Royall 1977). The majority of these birds occur in the eastern U.S.; for example surveys in the southeastern part of the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981). Meanley and Royal (1976) estimated 538 million blackbirds and starlings in winter roosts across the country during the winter of 1974-75.

An extensive population survey by Dolbeer and Stehn published in 1979 showed that, in the southwestern U.S., the number of breeding starlings doubled between 1968 and 1976. In California, where starlings were first observed in 1942, the number of breeding birds increased by 19% during the same period. According to the USGS North American Breeding Bird Survey-Summary of Population Change during the period of 1997-2000, European starling numbers decreased in Massachusetts. In the same time period, common grackle and brown-headed cowbird numbers also decreased. Red-winged blackbird and American crow numbers increased over this period (Sauer et al. 2001).

North American Breeding Bird Survey
Summary of Population Change in MA Blackbirds
Trend Estimates for 1997-2000

	Trend Estimate	P value	# of routes	Variance	Average Count
European Starling	**-10.02**	**0.18864**	**20**	**53.5217**	**32.81**
Brown-headed Cowbird	**-5.05**	**0.30347**	**20**	**22.6536**	**5.73**
Common Grackle	**-2.39**	**0.69483**	**20**	**35.7806**	**18.68**
Red-winged Blackbird	**1.77**	**0.75543**	**20**	**31.1391**	**17.61**
American Crow	**1.51**	**0.64936**	**20**	**10.6039**	**32.63**

The nationwide starling population has been estimated at 140 million (Johnson and Glahn 1994). The winter starling population in the northwest and southwest regions has been estimated at 27.8 million (Meanley and Royall 1976). The northwest and southwest regional population of the blackbird group is 139 million of which 27.8 million are starlings (Meanley and Royall 1976).

All of the above information indicates that populations of starlings and blackbirds have been relatively stable in recent years. For most species that show upward or downward trends, such trends have been relatively gradual. Additionally, blackbird populations are healthy enough, and the problems they cause great enough, that the USFWS has established a standing depredation order for use by the public. Under this "order" (50 CFR 21.43), no Federal permit is required by anyone to remove blackbirds if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.

During FY 98- 00, MA WS personnel at MA Airports lethally removed 25 European starlings off of flight lines and airfields. States in the WS Eastern Region reported a total kill of between 67,416 and 243,110 blackbirds and starlings per year. The average annual reported kill was 131,068 blackbirds and starlings (data from WS MIS system). No other sources of major human-caused blackbird and starling mortality are known.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). The northwest and southwest regional population of the blackbird group has been estimated to be about 140 million of which about 28 million are starlings (Meanley and Royall 1976). Estimated natural mortality of the blackbird group should therefore be between 60 and 75 million birds annually.

Dolbeer et al. (1995) showed that WS kills of 3.6% of the wintering population had no effect on breeding populations the following spring. Dolbeer et al. (1976) constructed a population model which indicated that a reduction of 14.8% of the wintering blackbird population would reduce the spring breeding population by 20% and that a 56.2% reduction in the wintering blackbird population would reduce spring breeding populations by only 33%. Given the density-dependent relationships in a blackbird population (i.e. decreased mortality and increased fecundity of surviving birds) a much higher number would likely have to be killed in order to impact the regional breeding population.

Cumulative impacts would be mortality caused by the MA WS program added to the other known human causes of mortality. Given that the maximum annual mortality of approxi- mately 7,500 blackbirds and starlings caused by the MA WS and the estimated kill of 243,110 for the Eastern Region, the proposed control projects implemented under this alternative would have no significant impact on overall breeding populations. Wildlife Services anticipates that no more than 5,000 starlings, 1,000 brown-headed cowbirds, 500 common grackles, 500 red-wing blackbirds, or 500 American crows will be lethally removed by WS on MA airports on an annual basis.

It should also be noted that starlings, are a non-indigenous and invasive species. Because of their negative impacts and competition with native birds, they are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in starling populations in North America,

even to the extent of complete eradication, could be considered a beneficial impact to native bird species.

4.1.1.1.2 Feral Domestic Pigeon Population Impacts

The feral domestic pigeon, also known as the rock dove, is an introduced non-native species in North America. Breeding Bird Survey data indicate the species has been decreasing slightly in Massachusetts between 1997 and 2000 (Sauer et al. 2001).

Massachusetts Trend Estimates for 1997-2000

Trend Estimate	P value	Number of routes	Variance	Average Count
-5.63	**0.60535**	**11**	**110.6985**	**5.50**

No population estimates are conducted by MADFW and no Federal laws protect the species. MA state law only requires a valid hunting license with no closed season or limit. Any reduction in pigeon populations, even substantial regional or nationwide reductions, would not be considered an adverse impact because this species is not part of native ecosystems. As with starlings, reductions, even to the extent of complete eradication, could be considered a beneficial impact to native bird species and the human environment. However, some individuals who experience aesthetic enjoyment of pigeons may consider major population reduction in some localities a negative impact.

Any WDM involving lethal control actions by WS for this species would be of restricted to isolated individual sites, or localities. In those cases where feral domestic pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved, although regional population impacts would be minor. This would be considered to be a beneficial impact since the affected property owner or administrator would request it.

Between FY 98 and FY 01, MA WS @ MA Airports took 369 pigeons, primarily to reduce hazards associated with dropping damage in and around hangers. This number of pigeons taken at multiple sites undoubtedly had little effect on overall pigeon populations in Massachusetts. Massachusetts Wildlife Services expects to produce a maximum annual mortality of 500 pigeons, proposed control projects implemented under this alternative would have no significant impact on overall breeding populations.

4.1.1.1.3 Gull Population Impacts

Herring gulls (Larus argentatus), ring-billed gulls (Larus delawarensis), and great black-backed gulls (Larus marinus) are year round residents across Massachusetts. The laughing gull (Larus atricilla) is a summer resident along the coast. These species are medium to large birds that are gregarious and often form large flocks. Gull numbers are high in New England with herring gulls dominant along the coast and ring-billed gulls more common inland. No breeding bird estimates are available for great black-backed gulls, laughing gulls or ring-billed gulls within the Commonwealth of Massachusetts from the USGS. Breeding estimates for herring gulls show a decline between 1997 and 2000 (Sauer et al. 2001).

North American Breeding Bird Survey

Massachusetts Trend Estimates for 1997-2000	Trend Est.	P value	# of routes	Variance	Average Count

Herring Gull	**-16.60**	**0.73847**	**2**	**1451.5481**	**2.31**
Massachusetts Trend Estimates 1980-2000					
Great Black-backed Gull	**-9.5**	**0.13**	**3**		
USFWS Region 5 Trend Estimates 1980-2000					
Laughing Gull	**1.1**	**0.83**	**46**		
Ring-billed Gull	**1.9**	**0.45**	**85**		

According to population estimates provided by MADFW during the 1990's herring gulls breeding in Massachusetts remained stable at approximately 32,000 individuals. During the same period, great black-backed gulls breeding in Massachusetts increased from 10,000 individuals to approximately 32,000 individuals.

In Massachusetts, the placement of airports and the behavior of gulls often puts them in conflict with one another. Many airports in Massachusetts are near the ocean or large bodies of water or near landfills and transfer stations where gulls feed. Also, blacktop on airport runways and taxiways collect heat during the day making them excellent places for gulls to keep warm while they loaf. The short grass on airports gives clear view of approaching predators and access to earthworms and insects during wet weather. Combine these attractions with the gulls habits of daily movement to feeding and roosting areas and soaring in large flocks and the danger to aviation is clear. Gulls are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. During FY 99-02 WS @ MA Airports has taken only 1 herring gull and harassed 22 others from it's airfields. Given that the expected maximum annual mortality caused by MA-WS would be 500 gulls, in any species combination, the proposed control projects implemented under this alternative would have no significant impact on overall breeding population.

4.1.1.1.4 Horned Lark Population Impacts

Horned Larks (*Eremophila alpestris*) are a small passerine that is found throughout North America. Breeding Bird Survey data indicates the species has been stable or slightly decreasing across the United States from 1967 to 1995 (Sauer et al. 1999). Data for Region 5 of the USFWS indicates a slight increase in population (Sauer et al. 2001). Horned larks are a widespread occupant of open habitats and prefer areas with sparse vegetation and exposed soil. In eastern North America, most pairs occupy tilled fields, the grassy fields bordering airports and similar habitats and are occasionally found in vacant lots within cities (Sauer et. al. 1999). The hazards that these bird present to human health and safety is tremendous. The horned lark is the single most common bird struck by aircraft in the U.S. Air Force, and is 11th in cost damage of $2,764,273.31 (USAF 2000). Horned Larks are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In FY 98-01 WS @ MA Airports has taken no birds and harassed no birds on it's airfields. Given that the maximum annual mortality of approximately 50 caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on the overall horned lark breeding population. It should also be noted that any take of horned larks would normally consist only of winter resident or migrating birds. During this period horned larks often form large flocks, often mixed with snow buntings and Lapland longspurs, that create an immediate threat to aircraft safety.

USFWS Region 5 Trend Estimates 1980-2000	Trend Estimate	P value	# of routes
	1.0	0.34	138

4.1.1.1.5 Snow Bunting Population Impacts

Snow bunting (*Plectrophenax nivalis*) are also a small passerine that is found across the northern U.S. and southern Canada during the winter months. In winter, snow buntings are gregarious, often traveling, roosting and feeding in large flocks. Buntings forage on the ground, often in open grassland, for seeds and insects. Coastal birds also feed on small crustaceans and mollusks. They often join other open-landscape birds, such as horned larks, in the fields bordering airports, especially along the coast in Massachusetts. This birds flocking habits make it extremely hazardous to aircraft. Snow buntings were involved in 3% of all strikes at one Massachusetts airport and many of these strikes were damaging. This is very meaningful for a bird the size of a house sparrow that is only in the area for about 3 months of the year. Snow buntings are also protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In FY 99-02 WS @ MA Airports has taken no birds and harassed no birds on it's airfields, however, the probability for control exists. Given that the maximum annual mortality of approximately 200 caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall snow bunting populations. No population trends were available for snow buntings in Massachusetts or the Northeast U.S.

4.1.1.1.6 Canada Geese Population Impacts

Canada geese (*Branta canadensis*) are large waterfowl found throughout North America. Breeding Bird Survey data indicates the non-migrating (resident) population of this species has been growing quickly along the Atlantic Flyway from 1966 to 1998 (Sauer et al. 2000). Canada geese are a widespread occupant of open areas, ponds and wetlands. Their primary diet is vegetative matter the includes items such as grass, corn, and soybeans. Canada geese are also very adaptive to urban settings and often thrive in areas such as public parks and airport retention ponds. The hazards that these birds present to human health and safety is tremendous. The Canada goose is responsible for more than 82 million dollars in damage to USAF aircraft in over sixty collisions (USAF BASH Web site 2000). The Common-wealth of Massachusetts monitors populations by breeding bird surveys and the USFWS tracks harvest numbers. This data is used to set harvest dates and limits governed by the Commonwealth and USFWS guidelines. During FY 99-01 WS @ MA Airports have taken 40 birds, while harassing more than 376 birds from it's airfields. The estimated resident population for August 1997 in Massachusetts was 38,000 statewide. This represents a 24% increase in the Canada goose population in Massachusetts between 1992 and 1997. According to USFWS data, during '99-00 and '00-02 seasons, harvests were as follows:

	99-00	00-01
September season	**6,200**	**4,100**
Regular season	**7,600**	**7,700**
Late season	**2,000**	**4,600**
Total	**15,800**	**16,400**

The take of 40 birds by WS over this period is less than 0.125% of the harvest. (Caithamer and Dubovsky, 1997) Given an expected maximum annual mortality of approximately 500 caused by MA-WS, the proposed control projects implemented under

this alternative would have no significant impact on overall Canada Goose breeding populations.

4.1.1.1.7 Swallows Population Impacts

Swallows are a small insectivorous bird from the family *Hirundinidae.* Swallows that are found throughout North America. Within the state of Massachusetts four species of swallows are common; the tree swallow, Northern rough-winged swallow, bank swallow, cliff swallow and barn swallow as well as the Purple Martin. Breeding Bird Survey data indicates an increase in the population of tree, bank and Northern rough-winged swallows and a decrease in the population of barn swallows. (Sauer et al. 2001).

North American Breeding Bird Survey

Massachusetts Trend Estimates for 1997-2000	**Trend Est.**	**P value**	**# of routes**	**Variance**	**Average Count**
Barn Swallow	-12.77	0.14149	18	67.7181	6.19
Tree Swallow	14.43	0.13977	17	84.9820	4.85
Bank Swallow	16.64	0.71033	5	1511.2543	0.42
N. Rough-winged Swallow	25.11	0.36328	5	551.1028	0.30
Massachusetts Trend Estimates for 1980-2000					
Purple Martin	2.9	0.56	2		

Swallows are a widespread occupant of open to semi open land, preferring fields, farmland, marshes and areas near water. The hazards that these bird present to human health and safety is tremendous. Swallows are second most common bird struck by aircraft in the U.S. Air Force, and is 10th in cost damage of $3,268,503.70 (USAF 2000). Swallows are protected by the USFWS under the Migratory Bird Treaty Act and the take is limited by permit. In FY 99-02 WS @ MA Airports have neither taken nor harassed swallows on airfields. Given a maximum annual mortality of approximately 100 estimated to be caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall swallow breeding population.

4.1.1.1.8 Abundance and Distribution of Deer

The MADFW is responsible for the monitoring and management of the states white-tailed deer (*Odocoileus virginianus*) population. This is done through management units using spotlight counts and harvest data. MADFW has divided the state into 14 deer management units. Populations vary from unit to unit depending on the quality of habitat. Deer are present in all of the management units, and occupy almost all undeveloped land that contains suitable deer habitat. MADFW concurs that the action taken by WS will not have any negative impacts on the Commonwealth's or the management unit's deer populations (Woytek 2002). This is due to the fact that WS obtains state depredation permits prior to any work to control deer on airports. WS work at airports in Massachusetts has resulted in the removal of 19 deer during FY98-01. Given that the maximum annual mortality of approximately 100 caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall deer population. This is a minimal number of animals compared to the Commonwealths harvest of 11,266 deer in 2000 (including 106 taken from the area around the Quabbin Reservoir) and 9,800 in 2001.

Overall, the Commonwealth's deer population is healthy and productive, with statewide population estimates of 80-90,000 animals. Some estimates even estimate the population at 100,000. The state wide deer population has remained stable or slowly increasing for the past several years. However, significant increases in local areas have occurred. These increases are likely due to a number of factors, including 1. Poor hunter access to land occupied by deer, 2. Local and state ordinances limiting hunting and/or discharge and use of firearms and bows, 3. Improved habitat and better management practices. MA-WS estimates a maximum of 100 deer may be removed annually.

4.1.1.1.9 Beaver, Muskrat and Woodchuck

The MADFW is responsible for the management of the states Beaver (*Castor canadensis*), Muskrat *(Ondatra zibethica*) and Woodchuck (*Mormota monax*) populations. At this time, MADFW monitors the sale of hides and requires tagging of beaver pelts. Currently, MADFW has open seasons that are as follows: Beaver may be trapped from 1 November to 15 April. Muskrats may be trapped 1 November to 28 February. Woodchuck may be hunted by any licenced hunter with no limit year round, except that no hunting is allowed during shotgun deer season.

During the period of FY 99 to FY 2002 WS took 20 beaver, 1 muskrat and 48 Woodchucks. The Commonwealth has no daily or seasonal bag limits for beaver, muskrat or woodchuck. A take of 20 beaver and 1 muskrat in a 3 year period on Massachusetts airports is less take than one would expect from a single experienced trapper in a single season. With trapping harvest regulations on the number of animals that can be taken this liberal, the impact of any take by WS on beaver and muskrat would be minimal and the maximum take by WS would be estimated at approximately 50 beaver and 50 muskrat annually. Also, the muskrat is prolific, and may have up to three litters during the summer. The first litter, sometimes 12 to 15, are born in March, and can have their own litter before fall arrives. If a pair of muskrats and their offspring all survived to breed as soon as possible, they could produce over 600 muskrats in just 2 years. (MA Hunting and Trapping Guide/MDC Furbearer Webpage 2001). Given that the maximum annual mortality of approximately 50 beaver and 50 muskrat projected to be caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall beaver and muskrat population. MADFW concurs that the action taken by WS will not have any negative impacts on the Commonwealth's beaver and muskrat population (C. Henner 2002). MADFW defers permitting for beaver control to Federal, State and Local health departments. WS obtains local health department depredation permits prior to any work to control beaver and muskrat on airports.

WS take of 48 woodchucks should also prove to be of minimal impact to the Commonwealth's population. Given that the maximum annual mortality of approximately 200 projected to be caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall woodchuck population (C. Henner 2002). This is supported by the open season Massachusetts has for woodchuck along with the basic biology of the species. Woodchucks have one litter a year that ranges from 2-6 young. The off-spring breed at age 1 and live 4-5 years. If a pair of woodchucks and their offspring all survived to breed as soon as possible, with an average litter size of 4 with a 1:1 sex ratio; they could produce over 645 woodchucks through their life time.

4.1.1.1.10 Coyote, Red Fox and Gray Fox

MADFW is also responsible for the management of wild canids including coyotes (Canis latrans), red fox (Vulpes vulpes) and gray fox (Urocyon cinereoargenteus). Since 1999, WS has removed 11 coyotes from Massachusetts airports. The potential exists for foxes to need removal as well, occasionally foxes cause disturbances when they are hunting or scavenging along runways. Given that the maximum annual mortality of approximately 30 wild canids caused by MA-WS, the proposed control projects implemented under this alternative would have no significant impact on overall wild canid population. This is supported by the coyote and fox hunting seasons which runs from 1/1/02 to 2/28/02 and 11/1/02 and the trapping season which runs from11/1/02 to 11/30/02. There are no daily, possession or season limits for coyote or fox. As previously stated, with these harvest regulations, impact of canid control by WS on Massachusetts airports would be minimal (MassWildlife 2002).

4.1.1.1.11 Rats, Moles, Mice and Voles

Rodents such as rats, feral mice, voles, and white-footed mice are common prey species found on airports, which in turn attract raptors to the airport environments. Any direct control for such rodents would be done to help prevent raptors from hunting near runways and taxiways. Impacts to such rodents would be minimal because any rodent control would be localized within the airport perimeters, and is supported by the high reproductive rate of these rodents.

4.1.1.1.12 Other Target Species

Target species in addition to those analyzed above that have been killed in small numbers by WS during the past several years include no more than an average of 20 individuals of a given species per year. (Table 4-1). Other species that could be killed during WDM include any of the species listed in Section 1.2. which are not protected by Federal or State endangered species laws. Any protected species would only be taken, or harassed in the case of bald or golden eagles, with proper permits, pre-authorized by the USFWS and MA DEP. None of these species are expected to be taken by WS WDM at any level that would adversely affect populations. Wildlife Services expects that a maximum of 50 individuals of any other target species may be taken annually. Any takes by MA WS are made with pre-approved state depredation permits or federal depredation permits co-signed by MADFW. When MADFW issues or co-signs depredation permits, as managers of wildlife resources, they concur that WS activities will not adversely affect any target species populations.

4.1.1.2 Alternative 2 - Non-lethal WDM Only by WS

Under this alternative, WS would not lethally take any target species and therefore would have no adverse impact on target species populations. Although WS take of target wildlife species would not occur, it is likely that airport personnel would implement their own lethal WDM program, in the absences of WS lethal WDM activities, resulting in similar or greater impacts than those of the current program alternative. However, for the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that target wildlife populations would be adversely affected by implementation of this alternative.

4.1.1.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, WS lethal take of target species would likely increase. Only lethal WDM would be used or recommended in all damage situations. For the same reasons shown in the

population impacts analysis in section 4.1.1.1, it is unlikely that target wildlife populations would be adversely affected by implementation of this alternative.

4.1.1.4 Alternative 4 -No Federal WS WDM

Under this alternative, WS would have no impact on target species populations. Although WS take of target wildlife species would not occur, it is likely that airport personnel would implement their own WDM program. Impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending upon the control methods implemented and the level of effort expended by airport personnel. However, for the same reasons shown in the population impacts analysis in section 4.1.1.1 it is unlikely that target bird and mammal populations would be adversely affected by implementation of this alternative.

4.1.2 Effects on Non-target Species Populations, including Threatened and Endangered Species.

4.1.2.1 Alternative 1 - Continue the Current Federal Bird Damage Management Program (The No Action/Proposed Action)

There has been no take of non-target species by MA WS during WDM activities during FY 97 - 00.

While every precaution is taken to safeguard against taking non-target species, at times changes in local animal movement patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the current program. Mitigation measures to avoid non-target and T&E species impacts are described in Chapter 3.

WS has obtained and reviewed the list of Federal and State T&E species for Massachusetts and has concluded that WS WDM activities in Massachusetts would not adversely affect any Federal or State listed T&E species.

Federal Listed T&E Birds, Mammals and Reptiles In Massachusetts

E – Bat, Indiana (*Myotis sodalis*)
T – Eagle, Bald (*Haliaeetus leucocephalus*)
T – Plover, Piping (*Charadrius melodus*)
E – Tern, Roseate (*Sterna dougallii*)
E – Plymouth (Eastern) Redbelly turtle (*Pseudemys rubriventris bangsi*)

State Listed T&E Birds, Mammals and Reptiles
Birds:

Leach's Storm-Petrel (*Oceanodroma leucorhoa*) E, Common Loon (*Gavia immer*) SC, Pied-Billed Grebe (*Podilymbus podiceps*) E, American Bittern (*Botaurus lentiginosus*) E, Least Bittern (*Ixobrychus exilis*) E, Bald Eagle (*Haliaeetus leucocephalus*) E/T, Northern Harrier (*Circus cyaneus*) T, Sharp-Shinned Hawk (*Accipiter striatus*) SC, Peregrine Falcon (*Falco peregrinus*) E, King Rail (*Rallus elegans*) T, Common Moorhen (*Gallinula chloropus*) SC, Piping Plover (*Charadrius melodus*) T/T, Upland Sandpiper (*Bartramia longicauda*) E, Roseate Tern (*Sterna dougallii*) E/E, Common Tern (*Sterna hirundo*) SC, Arctic Tern (*Sterna paradisaea*) SC, Least Tern (*Sterna antillarum*) SC, Barn Owl (*Tyto alba*) SC, Long-Eared Owl (*Asio otus*) SC, Short-Eared Owl (*Asio flammeus*) E, Sedge Wren (*Cistothorus platensis*) E, Golden-Winged Warbler (*Vermivora chrysoptera*) E, Northern Parula (*Parula americana*) T, Blackpoll Warbler (*Dendroica striata*) SC, Mourning Warbler (*Oporornis philadelphia*) SC, Vesper Sparrow

(*Pooecetes gramineus*) T, Grasshopper Sparrow (*Ammodramus savannarum*) T, Henslow's Sparrow (*Ammodramus henslowii*) E.

Mammals:

Water Shrew (*Sorex palustris*) SC, Rock Shrew (*Sorex dispar*) SC, Indiana Myotis (*Myotis sodalis*) E/E, Small-Footed Myotis (*Myotis leibii)* SC, Southern Bog Lemming (*Synaptomys cooperi*) SC

Reptiles:

Spotted Turtle (*Clemmys guttata*) SC, Wood Turtle (*Clemmys insculpta*) SC, Bog Turtle (*Clemmys muhlenbergii*) E, Blanding's Turtle (*Emydoidea blandingii*) T, Diamondback Terrapin (*Malaclemys terrapin*) T, Eastern Redbelly Turtle (*Pseudemys rubriventris*) E/E, Eastern Box Turtle (*Terrapene carolina*) SC, Eastern Worm Snake (*Carphophis amoenus*) T, Eastern Rat Snake (*Elaphe obsoleta*) E, Copperhead (*Agkistrodon contortrix*) E, Timber Rattlesnake (*Crotalus horridus*) E.

WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). The 1992 Biological Opinion (B.O.) concluded that the Indiana bat, Roseate Tern and piping plover would not be adversely affected by any aspect of the WS program, which included all methods of WDM described herein (USDA 1997, Appendix F).

The 1992 Biological Opinion from the USFWS determined that the only WDM method that might adversely affect the bald eagle was above ground use of strychnine treated bait for "nuisance birds." Strychnine is no longer registered for above ground use and would not be used by WS for WDM in the State. DRC-1339 poses no primary hazard to eagles because eagles do not eat grain or other bait materials on which this chemical might be applied during WDM, and, further, because eagles are highly resistant to DRC-1339 — up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS WDM in Massachusetts is not likely to have adverse effects on bald eagles.

Massachusetts WS has determined that WDM activities will have no effect on those Massachusetts T&E species not included in the 1992 Biological Opinion and that the use of alpha-chloralose by WS employees or persons under their direct supervision will have no effect on any federally listed T&E species in Massachusetts.

DRC-1339 and Avitrol. The inherent safety features of DRC-1339 and Avitrol use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the ADC FEIS (USDA 1997, Appendix P). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from the proposed action. DRC-1339 poses no primary hazard to eagles because eagles do not eat grain or other bait materials on which this chemical might be applied during WDM, and, further, because eagles are highly resistant to DRC-1339. Up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS use of DRC-1339 and Avitrol at Massachusetts airports will have no adverse effects on bald eagles.

Other WDM Chemicals. Any operational uses of WDM chemicals would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations that are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on non-target species populations.

4.1.2.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS take of non-target animals would likely be less than that of the proposed action because WS would take no lethal control actions. However, non-target take would not differ substantially from the current program because the current program has taken no non-target animals during CY 97-99. However, at airports where wildlife damage problems were not effectively resolved by non-lethal control methods and recommendations, airport personnel would likely resort to other means of WDM control such as shooting and trapping. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.2.3 Alternative 3 Lethal WDM Only by WS

Under this alternative, WS take of non-targets would not differ substantially from the current program described in section 4.1.2.1. Since all WDM control methods would not be available for use or recommendation by WS, wildlife conflicts may not be reduced to an acceptable level leading to non-WS personnel implementing their own WDM activities. Although technical support, might lead to more selective use of lethal control methods by non-WS personnel than that which might occur under Alternative 2, airport efforts to reduce or prevent damage could still result in less experienced persons implementing control methods leading to greater take of non-target wildlife than under the proposed action

4.1.2.4 Alternative 4 -No Federal WS WDM

Under this alternative, there would be no impact on non-target or T&E species by WS. Although WS take of non-target wildlife species would not occur, it is likely that airport personnel would implement their own WDM program. Impacts on non-target species under this alternative could be the same, less, or more than those of the proposed action depending upon the control methods implemented and the level of effort expended by airport personnel. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds.

4.1.3 Economic Losses to Property

4.1.3.1 Alternative 1- Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Airport officials are concerned with the economic cost associated with damage caused by wildlife to aircraft and other airport property. Wildlife can cause severe damage or total loss to aircraft, structural damage to aircraft hangers and airport buildings, obstruction and damage of water control structures, damage to the perimeter security fencing and damage to other airport property. An Integrated Wildlife Damage Management program (the current program), a combination of lethal and non-lethal means, has the greatest potential of successfully reducing damage to property since all WDM methods, tools and methodology would be available for consideration and use.

4.1.3.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, if WS non-lethal techniques were ineffective at reducing damage to acceptable levels, wildlife damage to property could increase resulting in greater negative impacts than the proposed action.. If non-lethal WDM methods did not reduce or eliminate damage no other options would be available from WS. However, airport personnel would have the option of implementing their own lethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a program.

4.1.3.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, if WS lethal techniques were ineffective at reducing damage to acceptable levels, wildlife damage to property could increase resulting in greater negative impacts than the proposed action. However, airport personnel would have the option of implementing their own nonlethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a program. In some situations due to safety considerations and airport regulations, such as areas on airports where discharge of firearms is not safe or allowed, some lethal WDM methods would not be available for use by WS. Therefore, if airport personnel did not implement their own nonlethal WDM program in those situations, damage to property would likely continue or possibly increase.

4.1.3.4 Alternative 4 - No Federal WS WDM

Under this alternative, WS would have no impact on reducing damage to property. Although WS would not be involved with WDM at Massachusetts airports, it is likely that airport personnel would implement their own WDM program in the absence of WS. Negative impacts caused by wildlife to property could be the same or more than those of the proposed action depending upon the control methods implemented and the level of effort expended by airport personnel.

4.1.4 Effects on Human Health and Safety

4.1.4.1 Safety and efficacy of chemical control methods

4.1.4.1.1 Alternative 1 - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997). Mitigation measures to reduce potential impacts to human health and safety are described in Chapter 3.

The following analysis indicates that human health risks from WS use of chemical WDM control methods, including DRC-1339 and Avitrol, would be virtually nonexistent under any alternative.

DRC-1339 (3-chloro-p-toluidine hydrochloride). DRC-1339 is the primary lethal chemical method that would be used under the current program alternative for lethal bird control. There has been some concern expressed by a few members of the public that unknown but significant risks to human health may exist from DRC-1339 used for WDM.

This chemical is one of the most extensively researched and evaluated pesticides ever developed. Over 30 years of studies have demonstrated the safety and efficacy of this compound. Appendix B provides more detailed information on this chemical and its use in WDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- Its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions expressed by a few members of the public, DRC-1339 is not applied to feed materials that livestock can feed upon).

- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that treated bait material generally is nearly 100% broken down within a week.

- It is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.

- Application rates are extremely low (less than 0.1 lb. of active ingredient per acre) (EPA 1995).

- A human would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur.

- The EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Regardless, however, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

Avitrol (4-Aminopyridine). Avitrol is another chemical method that might be used by WS for bird control. Although this chemical was not identified as being one of concern for human health effects, analysis of the potential for adverse effects is presented here. Appendix B provides more detailed information on this chemical.

- Avitrol is available as a prepared grain bait mixture that is mixed in with clean bait at no greater than a 1:9 treated to untreated mixture. In addition to this factor, other factors that virtually eliminate health risks to members of the public from use of this product as an avicide are:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 1996). Therefore, little of the chemical remains in killed birds to present a hazard to humans.

- A human would need to ingest the internal organs of birds found dead from Avitrol ingestion to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur. Furthermore, secondary hazard studies with mammals and birds have shown that there is virtually no hazard of secondary poisoning.

- Although Avitrol has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997) . Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the extremely controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical.

Rodenticides. Several anticoagulant rodenticides are used to control commensal rodents and some field rodents around building and other structures. Common anticoagulants include warfarin and diphacinone. Anticoagulants are normally classified s multiple-dose toxicants. For the materials to be effective, animals must feed on the bait more than once. However, some newer formulations only require a single feeding to e effective. Bait for rats and mice must be continuously available for 2 to 3 weeks for effective population control.

Zinc phosphide is a metallic toxicant most often used for rat, vole, muskrat, and nutria damage control. The odor of zinc phosphide is attractive to rodents but repulsive to most other animals. Tarter emetic is sometimes added to baits used to control rats. This safety feature will cause most other species to regurgitate any zinc phosphide baits they may consume. Its effectiveness for rat control is not compromised because rats are unable to regurgitate.

Large Gas Cartridges. The Large Gas Cartridge is placed in burrows/dens and is burned to create carbon monoxide gas to euthanize animals. Applicators must exercise caution to avoid burns to the skin or surrounding vegetation. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health and safety.

Other WDM Chemicals. Other WDM chemicals that might be used or recommended by WS include repellents such as methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption) and anthraquinone (Flight Control®), which are used as an area repellent, and the tranquilizer drug Alpha-chloralose. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before EPA or FDA would register them. Any operational uses of WDM chemicals would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations that are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

4.1.4.1.2 Alternative 2 – Non-lethal WDM Only by WS

Non-lethal chemical methods used or recommended by WS could include Alpha-chloralose, Avitrol, methyl anthranilate and anthraquinone (Flight Control®) which might raise concerns about human health risks. DRC-1339 is registered for use only by WS, therefore the use of this chemical would not be available for use under this alternative. As described in the Proposed Alternative, human health and safety risks

from WS use of chemical WDM control methods would be virtually nonexistent under any alternative.

4.1.4.1.3 Alternative 3 - Lethal WDM Only by WS

Chemical methods used by WS under this alternative could include DRC-1339, Alpha-chloralose, large gas cartridge, zinc phosphide, and rodenticides which might raise concerns about human health risks. As described in the Proposed Alternative, human health and safety risks from WS use of chemical WDM control methods would be virtually nonexistent under any alternative.

4.1.4.1.4 Alternative 4 - No Federal WS Wildlife Damage Management

Concerns about human health risks from WS's use of chemical WDM methods would be alleviated because no such use would occur. DRC-1339 and Alpha-Chloralose are only registered for use by WS personnel and would not be available for use by airport personnel. However, airport personnel would be able to use any chemical that is registered for commercial or private use. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS's assistance. However, use of Avitrol and any other registered chemical when used in accordance with label requirements should avoid any hazard to members of the public.

4.1.4.2 Impacts on human safety of non-chemical WDM methods

4.1.4.2.1 Alternative 1 - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Non-chemical WDM methods that might raise safety concerns include shooting with firearms, use of traps and snares, and harassment with pyrotechnics. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse impacts on human safety from WS's use of these methods are expected. Mitigation measures to reduce potential impacts to human health and safety are described in Chapter 3.

The Massachusetts WS program has had no accidents involving the use of firearms, traps, or pyrotechnics in which a member of the armed forces or the public were harmed. Firearms are only used by WS personnel who are experienced in handling and using them. WS traps are strategically placed to minimize exposure to airport personnel and pets. Body-grip (i.e. Conibear) traps for beaver and muskrats are restricted to water sets, which further reduces threats to public and pet health and safety. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns.

4.1.4.2.2 Alternative 2 - Non-lethal by WDM Only by WS

Under this alternative, non-chemical WDM methods that might raise safety concerns include use of traps, and harassment with pyrotechnics and firearms. WS would not use firearms for lethal control but would still be able to use them as a harassment method. WS associated risks and impacts to human safety would be similar to the current program alternative. However, if WS non-lethal WDM methods did not reduce or eliminate damage no other options would be available from WS. Airport personnel would have the option of implementing their own lethal WDM program without WS assistance, with the potential impacts on human health and safety dependent upon the skills and expertise of those non-WS personnel implementing such a program. Potential impacts of these non-WS personnel could be the same or greater than the proposed action, but not likely to the extent that they would become substantial.

4.1.4.2.3 Alternative 3 – Lethal WDM Only by WS

Under this alternative, non-chemical WDM methods that might raise safety concerns include use of firearms, traps and snares. WS associated risks and impacts to human safety would be similar to the current program alternative. However, if WS lethal WDM methods did not reduce or eliminate damage no other options would be available from WS. Airport personnel would have the option of implementing their own nonlethal WDM program without WS assistance, with the potential impacts on human health and safety dependent upon the skills and expertise of those non-WS personnel implementing such a program. Potential impacts of these non-WS personnel could be the same or greater than the proposed action, but not likely to the extent that they would become substantial.

4.1.4.2.4 Alternative 4 - No Federal WS Wildlife Damage Management

Concerns about human health risks from WS's use of non-chemical WDM methods would be alleviated because no such use would occur. Airport personnel would have the option of implementing their own lethal WDM program without WS assistance, with the potential impacts on human health and safety dependent upon the skills and expertise of those non-WS personnel implementing such a program. Potential impacts of these non-WS personnel could be the same or greater than the proposed action, but not likely to the extent that they would become substantial.

4.1.4.3 Impacts on human safety from Wildlife strike hazards to aircraft

4.1.4.3.1 Alternative 1 - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action

Airport officials are concerned with the potential injury and loss of human life as a result of wildlife/aircraft collisions. An Integrated Wildlife Damage Management program (the current program), a combination of lethal and non-lethal means, has the greatest potential of successfully reducing or eliminating this concern since all WDM methods, tools and methodology would be available for consideration and use.

4.1.4.3.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, if WS non-lethal techniques were ineffective at reducing damage to acceptable levels, wildlife/aircraft strikes could increase resulting in greater negative impacts than the proposed action.. If non-lethal WDM methods did not reduce or eliminate damage no other options would be available from WS. However, airport personnel would have the option of implementing their own lethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a program

4.1.4.3.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, if WS lethal techniques were ineffective at reducing damage to acceptable levels, wildlife/aircraft strikes could increase resulting in greater negative impacts than the proposed action. However, airport personnel would have the option of implementing their own nonlethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a program. In some situations due to safety considerations and airport regulations, such as areas on airports where discharge of firearms is not safe or allowed, some lethal WDM methods would not be available for use by WS. Therefore, if airport personnel did not implement their own nonlethal WDM program in those

situations, threats of potential injury and loss of human life would likely continue or possibly increase.

4.1.4.3.4 Alternative 4 - No Federal WS WDM

Under this alternative, WS would have no impact on reducing threats of potential injury and loss of human life. Although WS would not be involved with WDM at Massachusetts airports, it is likely that airport personnel would implement their own WDM program in the absence of WS. Potential negative impacts to human injury and loss of life could be the same or more than those of the proposed action depending upon the control methods implemented and the level of effort expended by airport personnel

4.1.5 Effects on Aesthetics

4.1.5.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species

4.1.5.1.1 Alternative 1 - - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Some people who routinely view or feed individual birds and mammals such as geese and deer would likely be disturbed by removal of such animals under the current program. Some people have expressed opposition to the killing of any animal during WDM activities. Under the current program, some lethal control of wildlife would continue and these persons would continue to be opposed. However, many persons who voice opposition has no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, insubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest.

Some people do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. Some people who enjoy viewing wildlife would feel their interests are harmed by WS's non-lethal harassment program. Mitigating that impact, however, is the fact that a harassment program does not diminish overall numbers of wild animals in the area. People who like to view these species can still do so on State wildlife management areas, as well as numerous private property sites where the owners are not experiencing damage from wild birds mammals and are tolerant of their presence.

4.1.5.1.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would not conduct any lethal WDM but would still conduct harassment of wildlife that was causing damage. Some people who oppose lethal control of wildlife by government but are tolerant of government involvement in non-lethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS's lethal WDM activities under this alternative because WS would not kill the individual animal(s).

Some people do not believe that wildlife or bird roosts should even be harassed to stop or reduce damage problems. Some people who enjoy viewing wildlife would feel their interests are harmed by WS's non-lethal harassment program. Mitigating that impact, however, is the fact that a harassment program does not diminish overall numbers of wild animals in the area. People who like to view these species can still do so on State wildlife

management areas, as well as numerous private property sites where the owners are not experiencing damage from wild birds and mammals and are tolerant of their presence.

However, airport personnel would likely conduct lethal WDM activities that would no longer be conducted by WS. Therefore the impacts of this alternative would be similar to the proposed action.

4.1.5.1.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be implemented or recommended. People that have expressed opposition to the killing of any bird or mammal during WDM activities would likely be opposed to this alternative. However, many persons who voice opposition has no direct connection or opportunity to view or enjoy the particular animals that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, insubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest. Non-lethal methods would not be used or recommended by WS, therefore impacts of this alternative would be greater than the propose action.

4.1.5.1.4 Alternative 4 - No Federal WS WDM

Under this alternative, WS would not conduct any lethal or non-lethal WDM activities. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds and mammals would not be affected by WS's activities under this alternative. However, airport personnel would likely conduct similar WDM activities as those that would no longer be conducted by WS, resulting in impacts similar to the current program alternative.

4.1.5.2 Effects on Aesthetic Values of Property Damaged by Birds

4.1.5.2.1 Alternative 1 - - Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Airport officials are concerned with the negative aesthetic values associated with bird damage to property. An Integrated Wildlife Damage Management program (the current program), a combination of lethal and non-lethal means, has the greatest potential of successfully reducing aesthetic damage to property since all WDM methods, tools and methodology would be available for consideration and use. Relocation of nuisance roosting birds by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities to monitor the birds' movements is generally conducted to assure they do not reestablish in other undesirable locations.

4.1.5.2.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, if WS non-lethal techniques were ineffective at reducing damage to acceptable levels, negative aesthetic values associated with bird damage to property could increase resulting in greater negative impacts than the proposed action.. If non-lethal WDM methods did not reduce or eliminate damage no other options would be available from WS. However, airport personnel would have the option of implementing their own lethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a

program. Relocation of nuisance roosting birds by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities to monitor the birds' movements is generally conducted to assure they do not reestablish in other undesirable locations. Overall, impacts of improving aesthetic values would likely be slightly less than the proposed action.

4.1.5.2.3 Alternative 3 -. Lethal WDM Only by WS

Under this alternative, if WS lethal techniques were ineffective at reducing damage to acceptable levels, negative aesthetic values associated with bird damage to property could increase resulting in greater negative impacts than the proposed action. However, airport personnel would have the option of implementing their own nonlethal WDM program without WS assistance, with the success of this program dependent upon the skills and expertise of those non-WS personnel implementing such a program. In some situations due to safety considerations and airport regulations, such as areas on airports where discharge of firearms is not safe or allowed, some lethal WDM methods would not be available for use by WS. Therefore, if airport personnel did not implement their own nonlethal WDM program in those situations, damage to property would likely continue or possibly increase. Relocation of nuisance birds or bird roosts through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS does not provided non-lethal assistance to airport personnel, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

4.1.5.2.4 Alternative 4 - No Federal WS WDM

Under this alternative, WS would have no impact on reducing negative aesthetic values associated with bird damage to property. Although WS would not be involved with WDM at Massachusetts airports, it is likely that airport personnel would implement their own WDM program in the absence of WS. Negative aesthetic values caused by birds to property could be the same or more than those of the proposed action depending upon the control methods implemented and the level of effort expended by airport personnel. Relocation of nuisance birds or bird roosts through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS does not provided assistance to airport personnel, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative.

4.1.6 Humanness and Animal Welfare Concerns of Lethal Methods Used by WS

4.1.6.1 Alternative 1 -- Continue the Current Federal Wildlife Damage Management Program (The No Action/Proposed Action)

Under this alternative, methods viewed by some persons as inhumane would continue to be used in WDM by WS. These methods would include shooting, trapping and toxicants/chemicals such as DRC-1339 and Avitrol.

Shooting, when performed by experienced professionals, usually results in a quick death for target animals. Occasionally, however, some birds and mammals are initially wounded and must be shot

a second time or must be caught by hand and then dispatched or euthanized. Some persons would view shooting as inhumane.

The primary lethal chemical WDM method that would be used by WS under this alternative would be DRC-1339. This chemical causes a quiet and apparently painless death that results from uremic poisoning and congestion of major organs (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes; which are primarily disease, starvation, and predation. For these reasons, WS considers DRC-1339 use under the current program to be a relatively humane method of lethal WDM. However, despite the apparent painlessness of the effects of this chemical, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable.

The chemical Avitrol repels birds by poisoning a few members of a flock, causing them to become hyperactive (see discussion in Appendix B). Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock. The affected birds generally die. Some persons would view Avitrol as inhumane treatment of the affected birds, based on the birds' distress behaviors.

The primary lethal small mammal chemical WDM method that would be used by WS under this alternative would be rodenticides. Although it is difficult to develop objective quantitative measurements of pain or stress, rodents affected by these chemicals rarely display any evidence of pain. The rodents usually become listless and lethargic, and a quiet death normally occurs in 48 to 72 hours following ingestion. This method appears to result in a less stressful death than that which probably occurs by most natural causes; which are primarily disease, starvation, and predation. For these reasons, WS considers rodenticide use under the current program to be a relatively humane method of lethal WDM. However, despite the apparent painlessness of the effects of these chemicals, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable.

The large gas cartridge is used to lethally remove underground denning mammals such as woodchucks. The gas cartridge when ignited releases CO_2 gas into the den of the target species. CO_2 gas is a AVMA-approved euthanasia methods (Beaver et al. 2001). Most people would view AVMA-approved euthanization methods as humane.

Occasionally, birds captured alive by traps, by hand or with nets would be euthanized. The most common method of euthanization would be cervical dislocation and by CO_2 gas which are AVMA-approved euthanasia methods (Beaver et al. 2001) . Most people would view AVMA-approved euthanization methods as humane.

4.1.6.2 Alternative 2 – Non-lethal WDM Only by WS

Under this alternative, WS would not use lethal methods viewed as inhumane by some persons. However, airport personnel may reject non-lethal WDM recommended and provided by WS and would seek alternative lethal means resulting in impacts to humaneness similar to or greater than the proposed action. Impacts of lethal methods implemented by non-WS employees could be similar or greater than the proposed action depending upon their WDM training and experience. Since DRC-1339 would not be available to non-WS entities, only chemicals that can legally be used by properly licensed pesticide applicators could be used for WDM. These methods would include, but might not be limited to, Avitrol, repellants, zinc phosphide, rodenticides and gas cartridges. However, Avitrol would most likely be viewed as less humane than DRC-1339 because of the distress behaviors that it causes. Overall, people who perceive the use of lethal control methods by WS as inhumane would prefer this alternative to the proposed action.

4.1.6.3 Alternative 3 - Lethal WDM Only by WS

Under this alternative, only lethal WDM activities would be used or recommended by WS. These methods, which would include shooting, conibears, live trapping followed by euthanasia, and the use of toxicants/ chemicals such as DRC-1339, Avitrol, large gas cartridge, zinc phosphide, and rodenticides are viewed by some persons as inhumane. Impacts for this alternative would be similar to the proposed action.

4.1.6.4 Alternative 4 - No Federal WS WDM

Under this alternative, lethal methods viewed as inhumane by some persons would not be used or recommended by WS. Similar to Alternative 2, DRC-1339 would no longer be available for use since it is only registered for use by WS personnel. Avitrol would be available for private use and would likely be viewed by many persons as less humane than DRC-1339. Shooting, and WDM trapping and capture methods could be used by non-WS entities and, similar to the current program alternative, would be viewed by some persons as inhumane. Overall, it is likely that WDM would be similar or somewhat less humane with this alternative than under the proposed action, dependent upon the training and expertise of the person implementing control methods.

4.2 Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the 4 alternatives. Under the Proposed Action and Alternative 3, the lethal removal of wildlife by WS would not have a significant impact on overall wild bird and mammal populations in Massachusetts, but some local reductions may occur. This is supported by the MADFW, which is the agency with responsibility for managing wildlife in the State. No risk to public safety from the use of WDM tools and methods are expected when WS' services are provided and accepted by requesting individuals in Alternatives 1, 2 and 3, since only trained and experienced WS personnel would conduct and recommend WDM activities. There is a slight increased risk to public safety when persons that rejects WS assistance and recommendations in Alternatives 1, 2, and 3 conduct WDM activities, and when no WS assistance is provided in Alternative 4. In all 4 Alternatives, however, it would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS' participation in WDM activities to protect property, and human health and safety, the analysis in this EA indicates that WS Integrated WDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4-3 summarizes the expected impacts of each of the alternatives on each of the issues.

Table 4-3 Summary of the expected impacts of each of the alternatives on each of the issues.

Issues / Alternatives	Alternative 1 -- Continue the Current Federal WDM Program (The No Action/Proposed Action)	Alternative 2 – Non-lethal WDM Only by WS	Alternative 3- Lethal WDM Only by WS	Alternative 4 - No Federal WS WDM
Effects on Target Wildlife Species Populations	Local populations in areas with damage or threat of damage would be reduce and sustained at a lower level. No effects on state populations.	Impacts may equal or greater than the proposed action dependent upon action taken by non-WS personnel. No effects on state populations.	Local populations in areas with damage or threat of damage would be reduce and sustained at a lower level. No effects on state populations	Impacts may equal, less or more than the proposed action dependent upon action taken by non-WS personnel. No effects on state populations.
Effects on other Wildlife Species Populations, including T&E Species	No probable effect.	No probable effect. If non-WS personnel conduct lethal removal without WS, take of non-targets species may increase.	No probable effect.	If non-WS personnel conduct WDM, impacts on non-targets species may increase.
Economic Losses to Property	The proposed action has the greatest potential of successfully reducing losses.	Damage to property could remain the same, decrease or increase dependent upon action taken by non-WS personnel.	Damage to property could remain the same, decrease or increase dependent upon action taken by non-WS personnel.	Damage to property could remain the same, decrease or increase dependent upon action taken by non-WS personnel.
Effects on Human Health and Safety				
Chemical Control Methods	No adverse affect by WS	No adverse affect by WS	No adverse affect by WS	No effect by WS
Non-Chemical Control Methods	No adverse affect by WS	No adverse affect by WS	No adverse affect by WS	No effect by WS
Wildlife Strike Hazards	The proposed action has the greatest potential of successfully reducing this risk	Risks could be similar or greater than the proposed action dependent upon action taken by non-WS personnel.	Risks could be similar or greater than the proposed action dependent upon action taken by non-WS personnel.	Risks could be similar or greater than the proposed action dependent upon action taken by non-WS personnel.
Effects on Aesthetics	Variable. Resource owners receiving damage would likely favor this alternative. Some activist would oppose this alternative.	Variable. Resource owners receiving damage would likely not favor this alternative if damage is not reduced to acceptable levels. Some activist would oppose this alternative, but would likely prefer over Alternative 1 and 3.	Variable. Resource owners receiving damage would likely not favor this alternative if damage is not reduced to acceptable levels. Some activist would oppose this alternative.	Variable. Resource owners receiving damage would likely not favor this alternative if damage is not reduced to acceptable levels by non-WS personnel. Some activist would oppose this alternative, but would likely prefer over Alternative 1 and 3.
Humanness and Animal welfare Concerns of Lethal Methods Used by WS	Variable. Some people will view as inhumane. Other will view as humane.	No effect by WS. People who perceive the use of lethal control methods by WS as inhumane would likely prefer this alternative to the proposed action.	Variable. Some people will view as inhumane. Other will view as humane.	No effect by WS. People who perceive the use of lethal control methods by WS as inhumane would likely prefer this alternative to the proposed action.

Appendix A

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Appendix B

WILDLIFE DAMAGE MANAGEMENT (WDM) METHODS AVAILABLE FOR USE OR RECOMMENDATIONS BY THE MASSACHUSETTS WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS-NONCHEMICAL

Airfield management and property owner practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Airfield management or the property owner implements cultural methods and other management techniques. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practically. These methods include:

Cultural methods. These may include altering the flight times of departing and arrival times so that flying is at a time period of low wildlife activity. Restricting flying during Bird Watch Conditions (BWC) of Moderate or Severe can reduce threats to flying operations. Restrictions are outline in 91-15 (BW Plan).

Environmental/Habitat modification can be an integral part of WDM. Wildlife production and/or presence are directly related to the type, quality and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain wildlife species. Airports are responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of WDM strategies at or near airports to reduce BASH problems by eliminating nesting, denning, roosting, loafing and feeding sites. Generally, many BASH problems on airport properties can be minimized through management of vegetation and water on areas adjacent to aircraft runways.

Animal Behavior Modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve us of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods are included in this category are:

- Wildlife fence (Physical Exclusion)
- Bird-proof barriers
- Propane cannons
- Pyrotechnics
- Distress Calls and sound producing devices
- Chemical frightening agents
- Repellents
- Harassment with a radio controlled plane
- Mylar tape

These methods are generally only practical for small area. Scaring devices such as distress calls, propane cannons, raptor effigies and silhouettes, mirrors and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota et al. 1983, Conover 1982, Arhart 1972).

Wildlife Fence (Physical Exclusion) – A fence around the airfield could limit the entry of mammals onto the runway and taxiways. There are several types of fences that inhibit the movement of mammals onto the airfield area if properly installed including electric fencing, woven wire, and chain link fencing.

Bird-proof barriers can be effective but often are cost-prohibitive, particularly because of the aerial mobility of, which requires overhead barriers as well as peripheral fencing or netting. Buildings, hangers and display planes could be "bird proofed" using hardware cloth or netting, where feasible, to eliminate roosting and nesting areas.

Porcupine wire (e.g., Nixalite™, Catclaw™) is a mechanical repellent method that can be used to exclude pigeons and other bird from ledges and other roosting surfaces (Williams and Coorigan 1994). The sharp points inflict temporary discomfort on the birds as they try to land, which deters them from roosting. Drawbacks of this method are that some pigeons have been know to build nests on top of porcupine wires and the method can be expensive to implement if large areas are involved. Electric shock bird control systems are available from commercial sources and, although expensive, can be effective in deterring pigeons and other birds from roosting on ledges, window sills and other similar portions of structures (Williams and Corrigan 1994).

Auditory scaring devices such as propane cannons, pyrotechnics, electronic guards, sirens, scarecrows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Mott 1985, Shirota et.al. 1983, and Arhart 1972). These methods should be reinforced with other scaring devices such as shooting and other types of physical harassment.

Visual techniques such as use of mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly gives birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et.al 1986, and Tobin et.al. 1998). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Physical harassment by radio controlled airplanes are effective in several situations for dispersing damage-causing birds. This tool is effective in removing raptors from areas that are not accessible by other means. Radio controlled airplanes allow for up close and personal harassment of birds, while combining visual (eyespots painted on the wings) and auditory (engine noise and whistles attached to the aircraft) scare devices. Disadvantages of method are birds in large flocks do not respond well to the plane, training is required to become efficient, a good working relationship is required by the operator and air traffic controllers, weather conditions may restrict the ability/usefulness of the plane, and mechanical up keep.

Relocation of damaging birds to other areas following live capture generally would not be effective nor cost-effective. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions to the rule for relocating birds. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as migratory waterfowl, raptors, or T&E species. In these cases, WS would consult with the USFWS and/or State wildlife agency to coordinate capture, transportation, and selection of suitable relocation sites.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because

problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Egg addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see ***Egg oiling*** below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has shown to be effective.

Live traps are various types of traps designed to capture birds and mammals alive for relocation or euthanasia. Some examples are, snares, leg-hold traps, cage traps, clover traps, decoy traps, nest box traps, mist nets, etc. Live traps include:

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS' standard procedure when conducting pigeon trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked daily, every other day, or as appropriate, to replenish bait and water and to remove captured birds.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Mist nets are more commonly used for capturing small-sized birds such as house sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping "pockets" in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture.

Swedish Goshawk traps are large cage type traps used for catching large birds of prey such as hawks and owls. These traps are two part traps with live bait (pigeons, rabbits, or starlings) placed in the lower section. The birds of prey are captured, when then investigate the prey and perch on the trigger bar causing them to fall into the upper portions of the trap which closes around the bird.

Bal-chatri traps are small traps used for capturing birds of prey such as hawks and owls. Live bait such as pigeons, starlings, rodents, etc. are used to lure raptors into landing on the trap (Hygnstrom and Craven

1994) where nylon nooses entangle their feet and hold the bird. The trap is made of chicken wire or other wire mesh material which is formed into a Quonset hut-shaped cage that holds the live bait. The outside top and sides are covered with many nooses consisting of strong monofilament line or stiff nylon string.

Bow nets are small circular net traps used for capturing birds and small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and it triggered by an observer using a pull cord.

Hand nets are used to catch birds and small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles.

Net guns are devices used to trap birds and mammals. The devices project a net over at target using a specialized gun.

NONLETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) [administered by the EPA and the Massachusetts Department of Environmental Protection (MA DEP) or by the FDA]. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by MA DEP and are required to adhere to all certification requirements set forth in FIFRA and Massachusetts pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl (Dolbeer et al. 1993). Methyl anthranilate (MA) is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et.al. 1984; 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[3]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[4]), and of relatively low toxicity to fish and invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb. with retreating required every 3-4 weeks (RJ Advantage, Inc. 1997). An example of the level of expense involved is a golf course in Rio Rancho, NM where it was estimated that treating four watercourse areas would cost in excess of $25,000 per treatment for material alone. Cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water (RJ Advantage, Inc. 1997) which indicates the repellent effect is short-lived.

Another potentially more cost effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial

[3]An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

[4]An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

treatment before the birds abandon a treatment site (Dr. P. Vogt, RJ Advantage, Inc., pers. comm. 1997). Applied at a rate of about .25 lb./ acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by U.S. Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA).

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Pre-baiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, starlings, and English sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding and usually a few birds will consume a treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Bio-degradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. A formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997, Appendix P).

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1997) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bio-accumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, nontarget species and the public, and the

low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Egg oiling is method of suppressing reproduction of nuisance birds by spraying a small quantity of food grade corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability. (Pochop 1998; Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not renest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, starlings rejected grain to which charcoal particles were adhered (L. Clark, National Wildlife Research Center, pers. comm. 1999). If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, pers. comm. 1999).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellancy of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. ***Anthraquinone***, (Flight Control®) a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). This chemical is not yet registered in the U.S. but may become available at some future date. Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting starlings (Clark 1997). ***Napthalene*** (moth balls) was found to be ineffective in repelling starlings (Dolbeer et al. 1988).

LETHAL METHODS - MECHANICAL

Shooting with shotguns, air rifles, or rim and center fire firearms is sometimes used to manage bird and mammal damage problems when lethal methods are determined to be appropriate. Shooting is a very individual specific method and is normally used to remove a single offending bird or mammal. It is selective for target species and may be used in conjunction with the use of suppressed rifles, spotlights, decoys, bait and calling. The birds and mammals are killed as quickly and humanely as possible. Shooting can also be used as a ***dispersal technique***. Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. WS follows all firearm safety precautions when conducting WDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997).

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course

every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport Hunting. WS sometimes recommends sport hunting as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the State wildlife agency and USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Example of wildlife species that could be hunted include pigeon, white-tailed deer, crow, Canada geese, snow geese, and wild ducks.

Snap traps are more commonly know as mouse and rat traps. This type of trap remains legal in Massachusetts. These traps are commonly used to remove rodents and other small mammals such as weasels. A modified rat snap trap is often used to remove individual woodpeckers, starlings, and other cavity using birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area caused by the woodpecker. These traps pose no imminent danger to pets or the public.

Conibear (Body Gripping or Smooth Wire) Traps are the steel framed traps used to capture and quickly kill aquatic mammals. The traps are made of two steel square frames that are hinged on two sides and have one or two springs. When activated, the frames are quickly brought together causing death by cervical dislocation and/or suffocation by constriction in a very short period of time. In Massachusetts, conibear traps may only be used by special permit to take beaver or muskrats that are causing a threat to human health and safety or damage to property. Massachusetts WS only uses conibear traps size 330 for beaver and size 110 for muskrats. These are used exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface.

Cervical Dislocation is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) administered by the EPA and the MA DEP or by the FDA. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by MA DEP and are required to adhere to all certification requirements set forth in FIFRA and Massachusetts pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association (Beaver et al. 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339 is the principal chemical method that would be used for starling/blackbird and pigeon damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving

blackbird starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds, and mammals. For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as nonsensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to nontarget and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). Appendix P of USDA (1997) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

DRC 1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the WDM project

Zinc-Phosphide, is used to reduce rodent populations to assist in the management of predators. Zinc-phosphide at concentrations of 0.75% to 2.0% on grain, fruit, or vegetable baits, has been used successfully against such species as meadow mice, ground squirrels, prairie dogs, Norway rats, Polynesian rats, cotton rats and nutria. Zinc-phosphide is a heavy, finely ground gray-black powder that is partially insoluble in water and alcohol. When exposed to moisture, it decomposes slowly and releases phosphine gas (PH3) Phosphine, which is highly flammable, may be generated rapidly if the material comes in contact with dilute acids. Zinc-phosphide concentrate is a stable material when kept dry and hermetically sealed.

Although zinc phosphate baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. For many uses of zinc phosphate formulated on grain or grain-based baits, pre-baiting is recommended or necessary for achieving good bait acceptance.

When zinc phosphate comes into contact with dilute acids in the stomach, phosphate (PH3) is released. It is this substance that probably caused death. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication that occurs is similar to intoxication with yellow phosphorous, in which the liver is heavily damaged. Prolonged exposure to phosphine can produce chronic phosphorous poisoning.

Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is no secondary poisoning with this rodenticide. The bait however, remains toxic up to several days in the gut of the dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.

Warfarin and Diphacinone. Several anticoagulant rodenticides are used to control commensal rodents and some field rodents around building and other structures. Common anticoagulants include warfarin and diphacinone. Anticoagulants are normally classified s multiple-dose toxicants. For the materials to be effective, animals must feed on the bait more than once. However, some newer formulations only require a single feeding to be effective. Bait for rats and mice must be continuously available for 2 to 3 weeks for effective population control.

Large Gas Cartridge is registered as a fumigant by the EPA. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, and tasteless, poisonous gas. The combination of oxygen depletion and carbon monoxide exposure kills the animals in the den. Carbon monoxide euthanasia is recognized by the AVMA as an approved and humane method to euthanize animals (Beaver et al. 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Appendix C

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